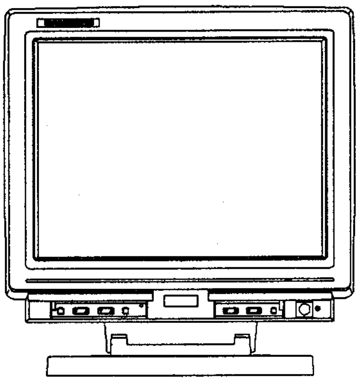
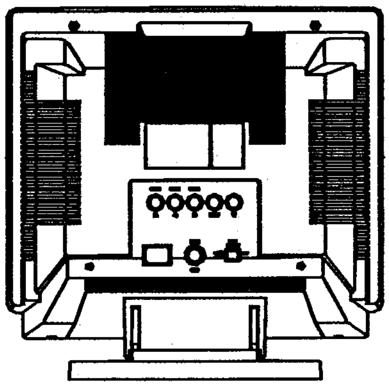
SAMSUNG

SERVICE MANUAL

21" COLOR MONITOR

MODEL NO. : CSC1677





SPECIFICATIONS

- Picture Tube
  E8215B22-TC05GTAR.
  21"Full Square. Flat Face.
  0.26mm Dot Pitch. 90° Degree Deflection.
  Non glare with Anti-Reflection. Anti-static.
  Medium short Persistence Phosphor.

- Input Signal
  Video: Analog 0.7Vp-p(Separate) or
  1.0Vp-p(Composite)
  75 ohm terminated.
  Positive bright.
  Sync: Sync on green.
  H/V composite.
  Separate.
  Positive/Negative.

- Synchronization
  Horizontal : 45KHz to 85KHz
  Vertical : 45Hz to 90Hz

- Max. Resolution
  Horizontal : 1664 Dots.
  Vertical : 1280 Lines.

- Video Band Width : 200 MHz at -3dB.

- Active Display
  Horizontal : 370 ±5mm.
  Vertical : 280 ±5mm.

- Power Supply
  AC 120V, 60Hz. ➔ Selectable
  AC 220V, 50/60Hz.
  Power Consumption : 150 Watt. Max.

- Operating Environment
  Temperature : 0°C to 33°C.
  Humidity : 10% to 90%.
  Altitude : 3000m Max.

- Dimension
  Height : 511mm.
  Width : 500mm.
  Length : 542mm.

- Weight : 35 Kg.

DESIGNS and SPECIFICATIONS are subjected to change without NOTICE.

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IMPORTANT SERVICE SAFETY PRECAUTIONS

Service work should be performed only by qualified service technicians who are thoroughly familiar with all of the following safety checks and servicing guidelines:

1. WARNING

1). For continued safety, do not attempt to modify the circuit.
2). Disconnect the AC power before servicing.
3). Semiconductor heat sinks are potential shock hazards when the chassis is operating.

2. SERVICING THE HIGH VOLTAGE SYSTEM AND PICTURE TUBE

When servicing the high voltage system, remove the static charge by connecting a 20kohm resistor in series with an insulated wire(such as a test probe) between the chassis and the anode lead. (The AC line cord should be disconnected from the AC outlet.)

1). The picture tube in this display monitor employs integral implosion protection.
2). Replace with a tube of the same type and number for continued safety.
3). Do not lift the picture tube by the neck.
4). Handle the picture tube only when wearing shatter proof goggles and after discharging the high voltage anode completely.

3. X-RADIATION AND HIGH VOLTAGE LIMITS

1). Be sure all service personnel are aware of the procedures and instructions covering X-radiation. The only potential source of X-ray in a current solid state display monitor is the tube. However, the picture tube does not emit measurable X-ray radiation if the high voltage is as specified in the "high voltage check" instruction.
It is only when high voltage is excessive that X-radiation is capable of penetrating the shell of the picture tube, including the lead in glass material. The important precaution is to keep the high voltage below the maximum level specified.
2). It is essential that serviceman have available at all times an accurate high voltage meter. The calibration of this meter should be checked periodically.
3). High voltage should always be kept at the rated value - no higher. Operation at high voltages may cause a failure of the picture tube or high voltage circuitry and, also under certain conditions, may produce radiation in excess of desirable levels.
4). When the high voltage regulator is operating properly there is no possibility of an X-radiation problem.
Everytime a color chassis is serviced, the brightness should be tested while monitoring the high voltage with a meter to be certain that the high voltage does not exceed the specified value and that it is regulating correctly.
5). Do not use a picture tube other than that specified or make unrecommended circuit modifications to the high voltage circuitry.
6). When troubleshooting taking test measurements on a display monitor with excessively high voltage, avoid being unnecessarily close to the display monitor. Do not operate the display monitor longer than is necessary to locate the cause of excecessive voltage.

4. BEFORE RETURNING THE DISPLAY MONITOR

4-1. FIRE AND SHOCK HAZARD

Before returning the display monitor to the user, perform the following safety checks:

1). Inspect all lead dress to make certain that the leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the display monitor.

2). Inspect all protective devices such as nonmetallic control knobs, insulating materials, cabinet backs, adjustment and compartment cover or shields, isolation resistor-capacitor networks, mechanical insulators, etc.

3). To be sure that no shock hazard exists, checks for leakage current in the following manner:
  - Plug the AC line cord directly into a 120volt AC outlet. (Do not use an isolation transformer for this test)
  - Using two clip leads, connect 1.5 kohm, 10 watt resistor paralleled by a 0.15uF capacitor in series with all exposed metal cabinet parts and a known earth ground, such as electrical conduit or electrical ground connected to earth ground.
  - Use a SSVM or VOM with 1000 ohms per-volt or higher sensitivity to measure the AC voltage drop across the resistor. (See Figure 1.)
  - Connect the resistor to all exposed metal parts having a return path to the chassis (metal cabinet, screw heads, knobs and shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor.
  - Any reading of 0.3volt RMS (this corresponds to 0.5milliamp.AC) or more is excessive and indicates a potential shock hazard which must be corrected before returning the display monitor to the user.

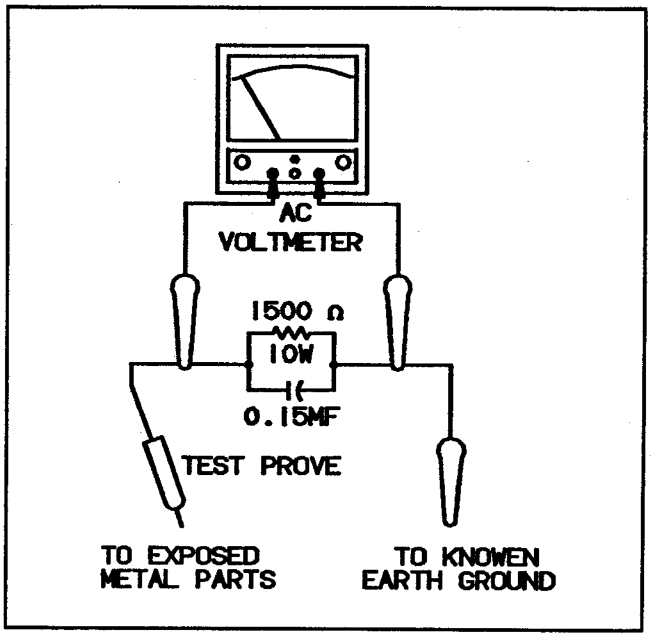


Figure 1. Leakage Current Test Circuit

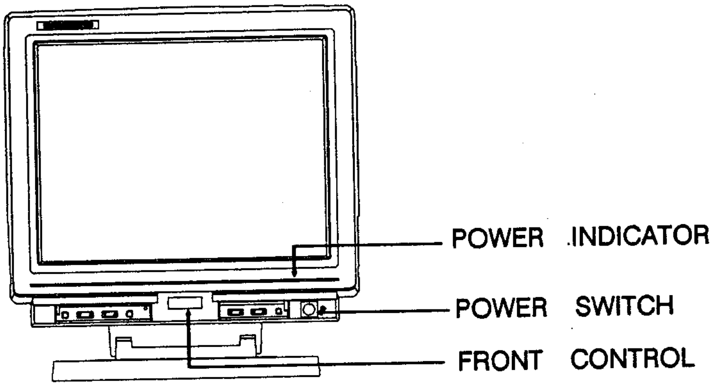
4-2. SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special characteristics often pass unnoticed and the protection afforded by them can not necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts that have these special safety characteristics are identified in this manual, and its supplement electrical components having such features are identified by a ! in the Parts List and Schematic diagrams. Before replacing any of these components, read the Parts List in this manual carefully. The use of substitute replacement parts that do not have the same safety characteristics as specified in the Parts List may create shock, fire, or other hazards.

GENERAL DESCRIPTION

1. CONNECTIONS & CONTROLS

1-1. FRONT VIEW


POWER INDICATOR
POWER SWITCH
FRONT CONTROL

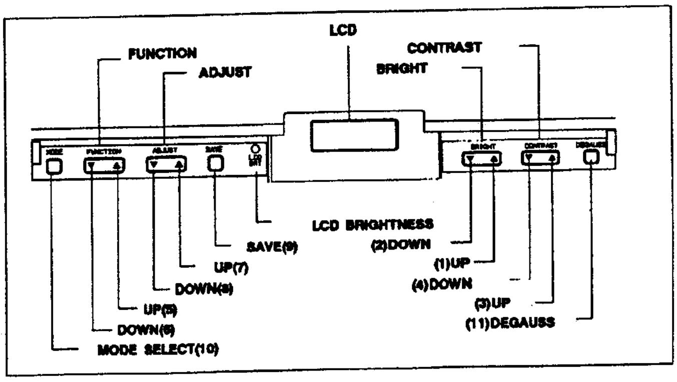
1). POWER INDICATOR
If you turn on the monitor, the power indicator light will go on.

2). POWER SWITCH
To turn on the monitor, push the power switch. The power switch light will go on, and stay on until the monitor is turned off. To turn off the monitor, push the power switch once again.

3). FRONT CONTROL
There are 11 keys inside the front door. The description about each keys is shown page 22.

1-2. INSIDE THE FRONT DOOR

INSIDE THE FRONT DOOR


LCD
FUNCTION
ADJUST
CONTRAST
BRIGHT
LCD BRIGHTNESS
SAVE(9)
(2)DOWN
UP(7)
(1)UP
DOWN(8)
(4)DOWN
UP(5)
(3)UP
DOWN(6)
(11)DEGAUSS
MODE SELECT(10)

1). LCD

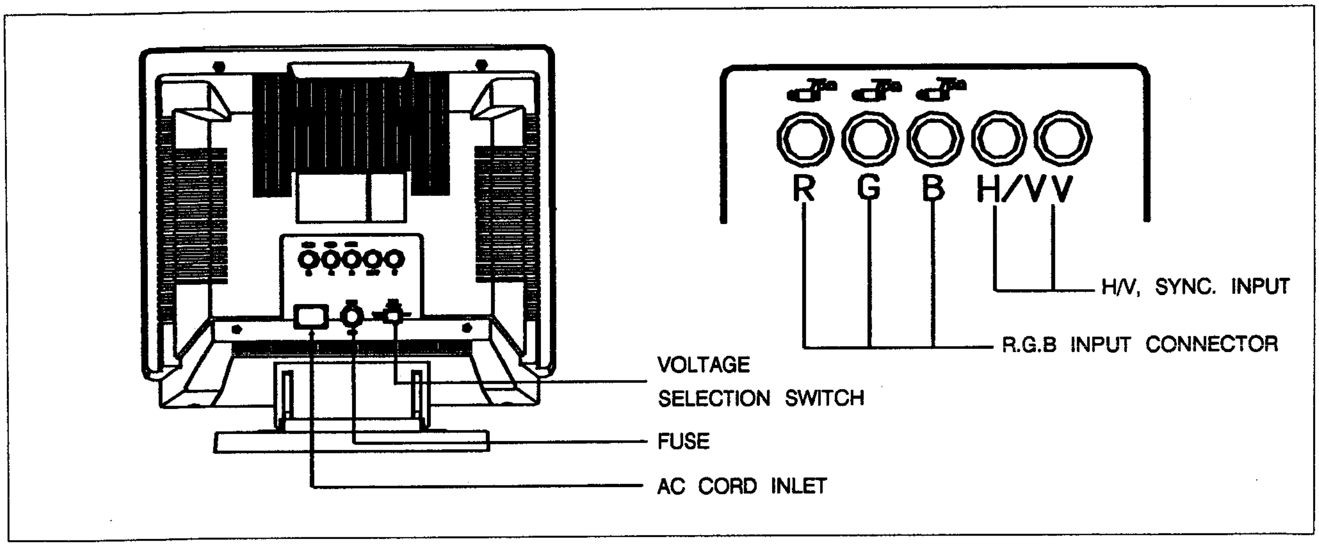
LCD displays various state of the CSC1677. During installation, LCD displays the state of the process of the monitor control software. It displays the present value of contrast, brightness, and the block of dots representing the degree of that in auto mode.

In user and service mode, it displays the function to adjust, the value and range of that.

2). LCD BRIGHTNESS

To control the brightness of LCD, rotate the LCD BRIGHTNESS clockwise or counterclockwise with a sharp instrument.

1-3. REAR VIEW


R
G
B
H/VV
H/V, SYNC. INPUT
R.G.B INPUT CONNECTOR
VOLTAGE SELECTION SWITCH
FUSE
AC CORD INLET

1). AC CORD INLET

2). VOLTAGE SELECT SWITCH

Used to select AC line voltage-either 120V or 220V.

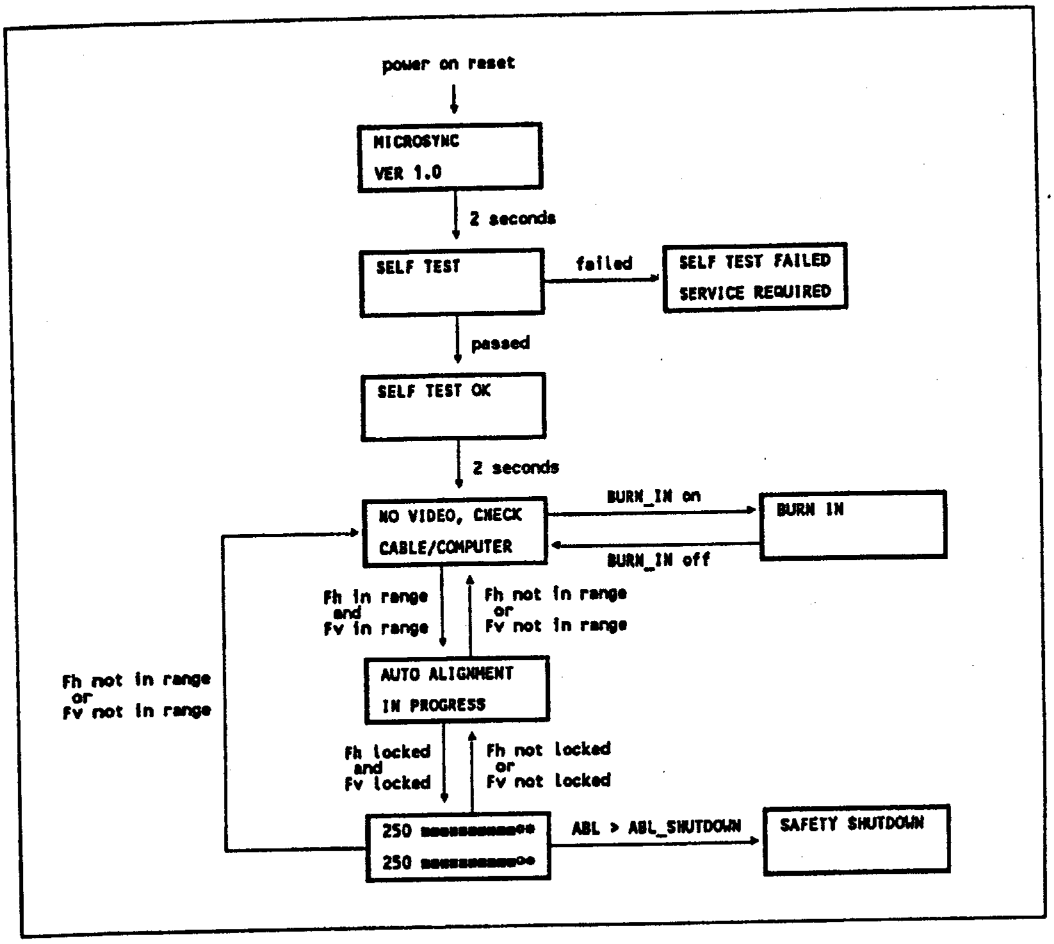
3). INPUT CONNECTOR

BNC Type receptacle for each R.G.B Video signal and external sync signals. When one display is used, the termination switch must be switched to 75 ohm.

4). FUSE.

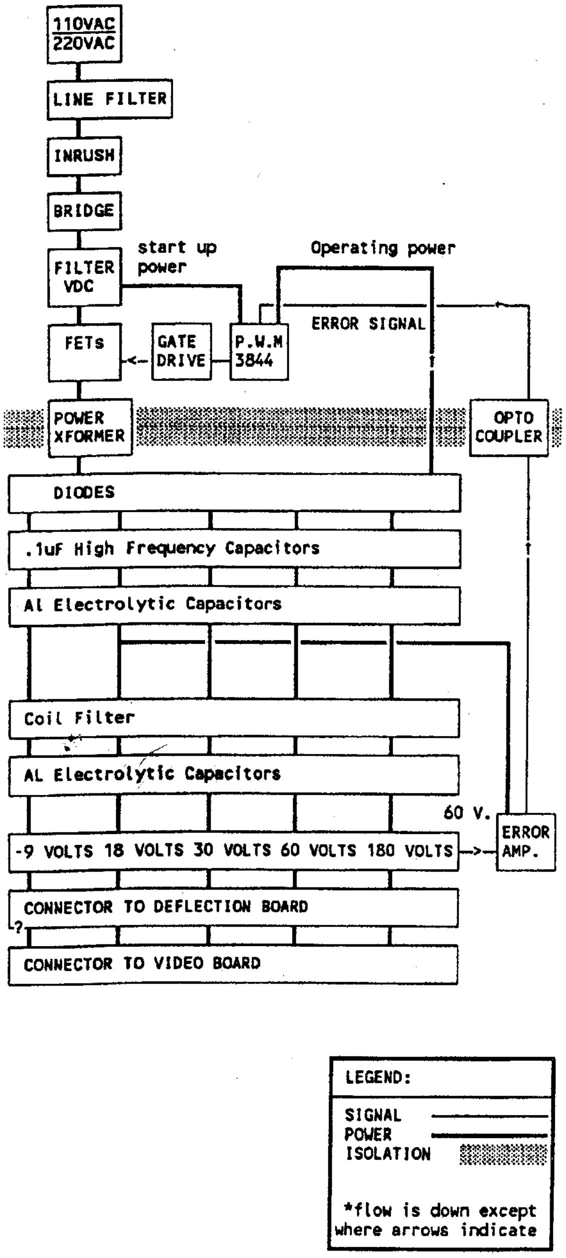
2. HOW TO INSTALL

1). Place the CSC1677 Monitor on a sturdy desktop or table.
2). Be sure the monitor power is off.
3). Connect the Video cable between the video board and monitor.
4). Connect the power cord. (Check the power selection S/W)
5. Turn on the monitor. Within seconds, you will see following sequence of message on LCD.


power on reset
MICROSYNC
VER 1.0
2 seconds
SELF TEST
failed
SELF TEST FAILED
SERVICE REQUIRED
passed
SELF TEST OK
2 seconds
NO VIDEO, CHECK
CABLE/COMPUTER
BURN_IN on
BURN IN
BURN_IN off
Fh in range and Fv in range
Fh not in range or Fv not in range
Fh not in range or Fv not in range
AUTO ALIGNMENT
IN PROGRESS
Fh locked and Fv locked
Fh not locked or Fv not locked
250 ■■■■■■■■■■■●●
250 ■■■■■■■■■■■○●
ABL > ABL_SHUTDOWN
SAFETY SHUTDOWN

3. OPERATION THEORY

3-1. THE POWER SUPPLY


110VAC
220VAC
LINE FILTER
INRUSH
BRIDGE
FILTER VDC
start up power
Operating power
FETs
GATE DRIVE
P.W.M 3844
ERROR SIGNAL
POWER XFORMER
OPTO COUPLER
DIODES
.1uF High Frequency Capacitors
Al Electrolytic Capacitors
Coil Filter
AL Electrolytic Capacitors
60 V.
-9 VOLTS 18 VOLTS 30 VOLTS 60 VOLTS 180 VOLTS
ERROR AMP.
CONNECTOR TO DEFLECTION BOARD
CONNECTOR TO VIDEO BOARD
LEGEND:
SIGNAL
POWER
ISOLATION
*flow is down except where arrows indicate

1) LINE INPUT

The input rectifier section converts the AC line voltage into a crudely filtered and unregulated DC voltage, to power the switching regulator. The input section is a full-wave bridge.

2) FILTER

To reduce noise from the power supply, a lowpass filter isolates the switcher. The conducted noise is filtered by X and Y capacitors and two common mode transformers.

3) POWER SUPPLY

The design uses a discontinuous flyback topology operating in current-mode resulting in a multiple output switcher with outputs which track well. Slower diodes are used. The fast transient response of the control loop maintains picture integrity. Very fast current limiting protects the switcher against short circuits.

4) P.W.M. INTEGRATED CIRCUIT

The 3844 is an intergrated current mode pulse width modulator. It consists of an oscillator, error amplifier, current sense comparator, under-voltage lockout, and an output MOSFET driver stage.

5) UNDER-VOLTAGE LOCKOUT

This circuit insures that Vcc is adequate to make the 3844 fully operational before enabling the oscillator, voltage reference, and before turning on the output stage. The turn on/off thresholds are at 16v and 10v respectively.

6) OSCILLATOR

The oscillator consists of a pull up resistor from the 5V reference to pin 4 and a timing capacitor to ground. When the voltage ramps up to about 2.8V on pin 4 an internal current source pulls down, discharging the timing capacitor to a 1.0V level. This level releases the current source and starts the next cycle. Oscillator frequency is roughly equal to 1/.55RC.

7) OUTPUT STAGE

The 3844 has a single totem-pole output capable of operating to 1.0 A peaks and a 200mA average current.

8) CURRENT SENSE COMPARATOR

Current-mode controllers inherently keep close watch over the pass transistor's current. Pin 3 is connected to a voltage comparator which shuts off the output when current reaches the desired level, as prescribed by the error amplifier. This way the controller will only allow the needed amount of power into the output transformer. This method differs from most pulse width controllers which compare the error amplifier's output against the oscillator's voltage ramp.
This results in control of on-time, which does not necessarily mirror the power stored in the transformer.

This comparator also serves the dual purpose of monitoring current limit. Any time pin 3 rises above 1 volt the output will terminate.
Output-short circuits and core saturations are detected before they destroy the pass transistor.

9) ERROR AMPLIFIER

Voltage on pin 2 is compared with a 2.5V, 2% source. Errors in output voltage are amplified and fed to pin 1 where they are frequency compensated by an RC back to pin 2. This error voltage is dropped by 1.4V and divided by 3 before being fed to the current comparator.

In this application, the error amplifier is on the secondary side of the switcher. The TL431, is a programmable reference. In side it consists of a temperature compensated reference and an amplifier. Any error in output voltage is compared against 2.5 volts and amplified. Frequency compensation is handled by C636 and C637. Error current passes through an optocoupler to another error amplifier,

10) Vcc

The 3844 draws very little current in start up mode. There is enough power from the line bleeder R605, R606 to slowly charge C608 to the 16 volts needed to start the switcher. When switching begins the Vcc fails quickly but before it drops to the 10 volt turn off level, the horizontal section of the monitor should be up and running. A few turns of wire from around the flyback transformer supplies power and synchronization.

11) POWER TRANSFORMER

Transistors Q603, Q604 starts a cycle by allowing current to flow into the primary of T603. As current ramps up with time, the voltage across current sense resistor R607 also ramps to a point where IC602 determines enough power is stored and turns off the FETs. As the voltage on the transformer reverses, power is dumped from the main power transformer through diodes in to the deifferent supplies. Clamp diodes check ringing which could over-voltage the power FETs.

To keep radio frequency radiation to a minimum and reduce transistor heating, a turn-off snubber network is placed across the FETs.

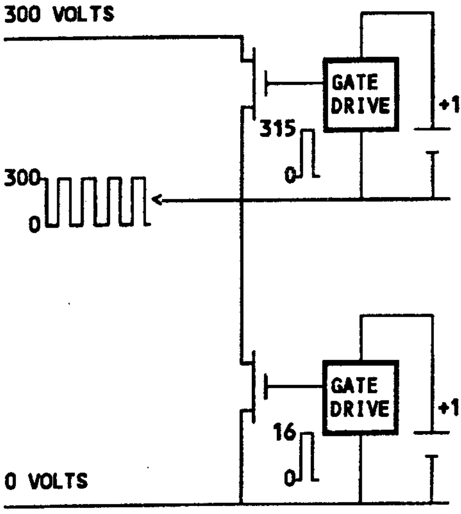
The transformer has a center leg gap with no gap in the outer legs. This greatly reduces the flux radiating from the cores. There is a large copper strap around T603 to reduce stray flux.

12) RECTIFICATION and FILTERS

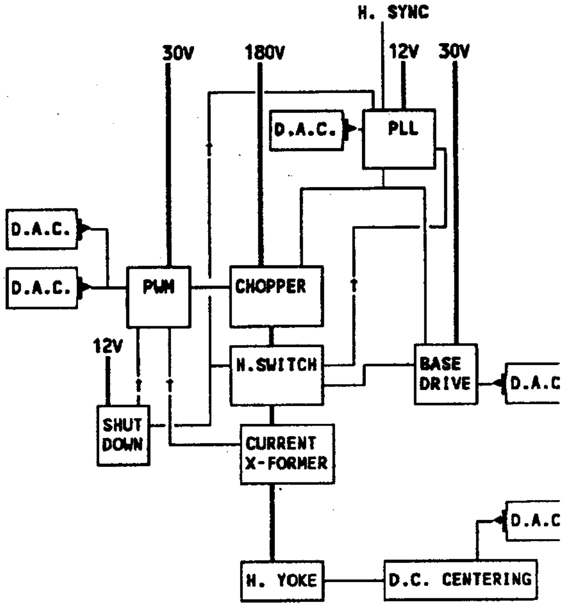
Currents from the secondary windings are rectified and filtered to create the desired voltages. Low internal series resistance electrolytic capacitors reduce ripple voltage. Small high current capacitors quickly return charging current to the source. Filter inductors remove high frequency noise.

13) GATE DRIVE

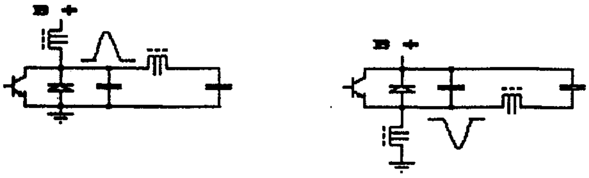
The bottom FET of the pair is easy to drive. The FET is off with the gate is at 0 volts and on at 16 volts. The top FET is off when the gate is at 0 volts and on when the gate is 15 volts above the 300 volt supply. A gate drive IC handles all the gate drive problems.


300 VOLTS
GATE DRIVE
+15
315
0
300
0
GATE DRIVE
+16
16
0
0 VOLTS

3-2. HORIZONTAL


H. SYNC
30V
180V
12V
30V
D.A.C.
PLL
D.A.C.
D.A.C.
PWM
CHOPPER
12V
H.SWITCH
BASE DRIVE
D.A.C
SHUT DOWN
CURRENT X-FORMER
D.A.C
H. YOKE
D.C. CENTERING

The next diagram shows a positive and a negative horizontal section. This monitor uses the positive approach in the horizontal section. The high voltage section uses the negative approach.

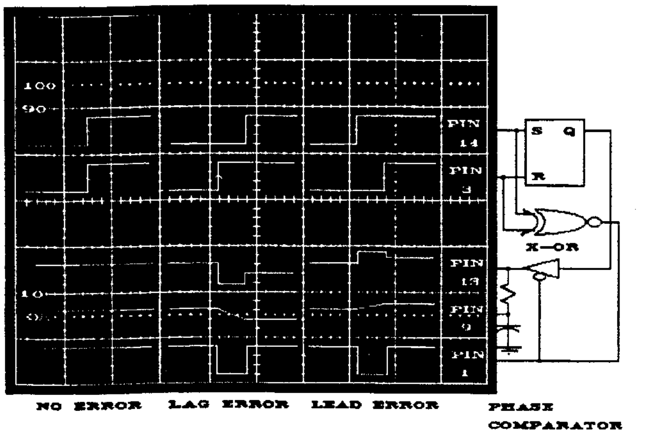


1) PHASE-LOCK LOOP

A phase-lock loop synchronizes the horizontal switch to the timing pulses from the computer. The phase-lock loop compensates for storage delay in the horizontal switch.
Incoming horizontal sync is lever-translated by a transistor is fed into the input of the phase comparator. IC402 pins 1 and 2 watch the falling edge of thf flyback pulse. A rising edge is sent to the other input of the phase-lock loop phase comparator.

The phase comparator operates in an edge lock mode. Integrated circuit IC401 pin 13 is in a high impedance mode most of the time. If the rising edges fed into pins 3 and 14 do not coincide, pin 13 goes into a low impedance state for the time difference. Depending on which edge leads the other, current flows into or is pulled out of the filter capacitors C401 and C405.

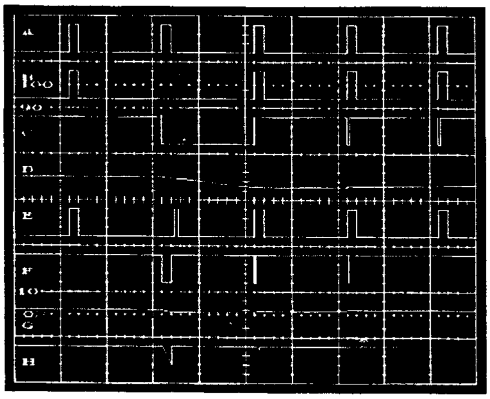
Voltage controlled oscillator input pin 9 determines the frequency and phase of the output square wave on pin 4. The free running frequency and lock range is set by C404, R402, R404, R403, R480.



2) MISSING SYNC

When the PLL does not see sync it tries to lower the frequency of the monitor. With some types of composite sync, during vertical sync, where will be no horizontal sync. The PLL will drop the horizontal frequency down a long way during the 3 to 4 missing syncs.

The figure below shows how the input of the voltage controls oscillator (pin 9) drops with only one missing sync. Trace A represents the input of the PLL that is watching the flyback pulse. Trace B is horizontal sync with one pulse missing. Trace C comes from pin 1 of the PLL and indicates when an error condition arrives. Trace D is the input of the voltage controlled oscillator. Notice how much the voltage drops in one line time and that the recovery is very slow.



There is a CMOS switch, IC403 4053 on the output of the PLL phase detector. The switch remains closed most of the time and the PLL works normally. If no error or small phase errors are detected the switch remains closed. If large errors are detected, like missing syncs or double syncs then the switch opens up after a time delay set by R411 and C407. With the switch open the phase detector will not be able to move the phase of the oscillator over. In this manor small errors are responded to but large errors have little effect.

3) DOUBLE SYNC

Refer to the sections **MISSING SYNCS** and **PLL** to understand the phase lock loop and what happens when phase error is detected.

Double horizontal sync pulses are sometimes sent during the front and back vertical sync time. If double sync is sent to the PLL the horizontal frequency will be driven up just like no sync drove the frequency down. The CMOS switch will open and the oscillator will not drift in phase very far.

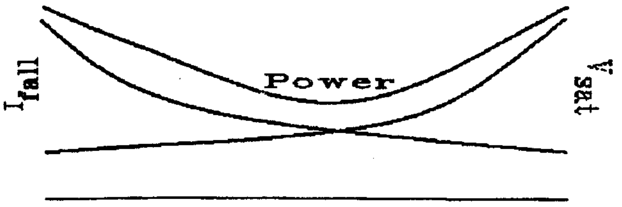
4) BASE DRIVE

When turned on, transistor Q403 turns off the horizontal switch Q406. At the same time, current is stored on trahstormer T401. When Q403 opens up this stored power supplies turn-on current for Q406. Regulator LM317 and a DAC sets the average power level to the base drive circuit. Snubbing circuits surround transformer T401. They control the discharge current waveform into the base.

5) BASE DRIVE DAC

The base drive DAC determines the amount of base drive. If the transistor is over driven the Vset looks very good, but the current fall time is poor. If the base current is too small the current fall time is very fast. The problem is that the transistor will have many volts across C-E when closed.

The best condition is found by placing the transistor in the heaviest load condition. Adjust the base resistor for the least power consumption.



6) CHOPPER

The horizontal section does not have a horizontal power supply voltage like most monitors. A chopper is used to take the 180 volt video supply and create the necessary power for the horizontal section. The duty cycle of the chopper is controlled by a pulse width modulator (PWM). The PWM watches the current in the horizontal yoke and adjusts the duty cycle to obtain the desired width.

7) HORIZONTAL SWITCH/DAMPER DIODE

On the right hand side of the screen, transistor Q413 conducts current through the deflection yoke. This current comes from the S correction capacitors, which has a charge equal to the effective supply voltage. Diode D401 allows current for the left hand side of the screen to flow back through the deflection yoke to the S capacitors.

8) FLYBACK CAPACITOR

The flyback capacitor connects the hot side of the yoke to ground. This component determines the size and length of the flyback pulse.
A FET selects the value of capacitor. These capacitors must be high current components.

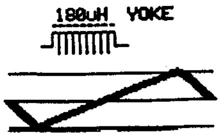
9) S CAPACITOR

Capacitors C442, C443, C444 and C471 corrects outside versus center linearity in the horizontal scan. The voltage on the S cap has a parabola plus the DC horizontal supply. Reducing the value of S cap increases this parabola this reducing the size of the outside characters and increasing the size of the center characters. Four FETs select the value of capacitance.

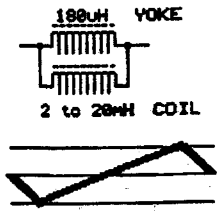
10) HORIZONTAL LINEARITY

In the yoke current path there is a saturable coil.
Just like a size coil, any inductance in series with the yoke will reduce the size of the picture. This saturable coil will change inductance depending on the amplitude and direction of current flow. At the start of a trace the linearity coil has an inductance of 20 percent of that of the yoke. By the center of the trace, the linearity inductance has decreased to about 4 percent of the yoke where it remains for the rest of the trace. Adjust this variable inductor so the right and left sides of the picture are the same size.

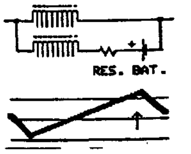
11) HORIZONTAL DC CENTERING



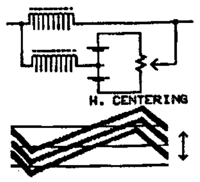
In the horizontal section of a monitor the yoke has DC on the cold end and a flyback pulse on the hot side. The current ramps in a sawtooth fashion centering around zero.


180uH YOKE
2 to 20mH COIL

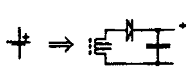
If a parallel coil is added the current through the yoke is not effected.



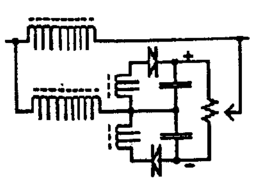
With the addition of a battery and limiting resistor the DC current is added to the current ramp.


H. CENTERING

A plus and minus supply gives full control of the DC offset current.



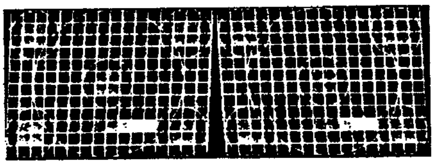
The batteries or power sources are created off a small secondary windings.



The final circuit has AC effect on the yoke but can cause a ±current flow through the yoke.

12) TILT

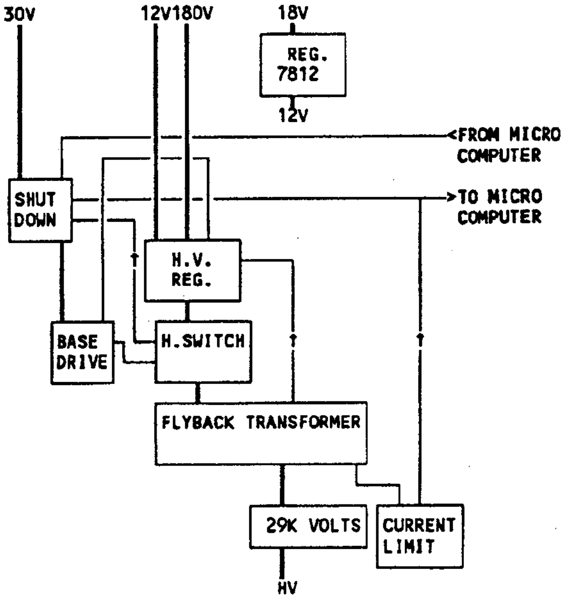
Tilt is the dynamic adjustment of the DC centering. The centering may be adjusted differently down the page. The top may be shifted right 2mm and the bottom shifted left by 1mm. This is tilt.



13) HORIZONTAL CENTERING CONTROL

The DC Centering op-amp is sitting many volts above ground. A isolation transformer is used to get signals up to the DC centering circuit. There are three windings on the transformer. The primary is powered by the output of a opamp. The bottom side of the primary is being driven by a chopping FET. The peak to peak AC voltage across all of the windings will approximately equal twice the out put voltage of the op-amp. The first secondary runs back into the input if the op-amp and is used as feed back. The second secondary sends a control voltage up to the DC centering circuit.

3-3. HIGH VOLTAGE


30V
12V
180V
18V
REG. 7812
12V
<FROM MICRO COMPUTER
>TO MICRO COMPUTER
SHUT DOWN
H.V. REG.
BASE DRIVE
H.SWITCH
FLYBACK TRANSFORMER
29K VOLTS
CURRENT LIMIT
HV

1) FLYBACK TRANSFORMER

The flyback transformer is separate from the horizontal section. This is done to allow greater flexibility when changing frequency and tube size. A small independent 'horizontal' section powers the flyback transformer and creates the high voltage.

2) ABL

The beam current is monitored on the ABL line. If the current from the 27kV supply is too high the micro controller will reduce is the brightness lever. If the current climes still higher the regulator will reduce the second anode voltage to keep the current under control. If the current continues to clime the micro computer will kill the high voltage.

3) X-RAY SHUT DOWN

When a fault in the high voltage section is detected the horizontal base drive is shut down. An over voltage condition in the high volt supply or an over current condition will turn off the high voltage.

4) HIGH VOLTAGE REGULATOR

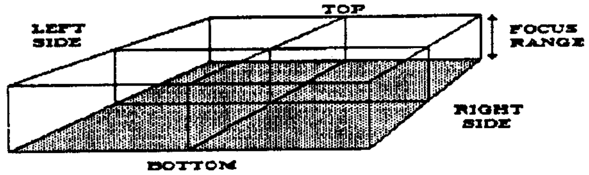
The patented high voltage regulator sits between the supply and the top of the primary of the flyback transformer. An on board switching regulator is powered from the 12 volt supply. The regulator watches the second anode voltage through a 300-mega Ohm resistor in the flyback tranformer. During flyback, the regulator pulls the top of the flyback transformer negative while the flyback pulse is raising the other end. In this way the size of the pulse, as seen by the flyback transformer, is varied to keep the second anode voltage constant independent of load.

The regulator should be adjusted by "high voltage adjustment" to the desired high voltage.

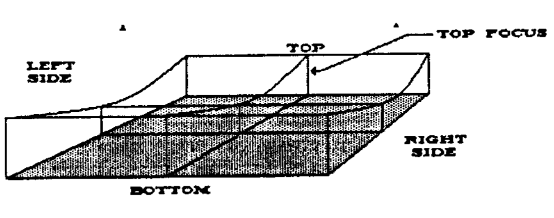
If the voltage on the ABL pin on the regulator drops below 4.3 volts the regulator will reduce the high voltage in an attempt to keep the beam current under control.

3-4. FOCUS

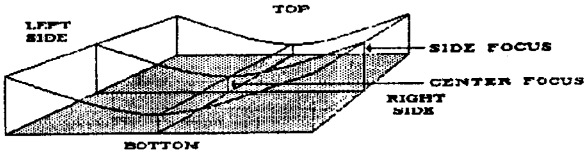
All monitors have the ability to set a focus voltage. The voltage is DC and will be the same for all areas of the picture.



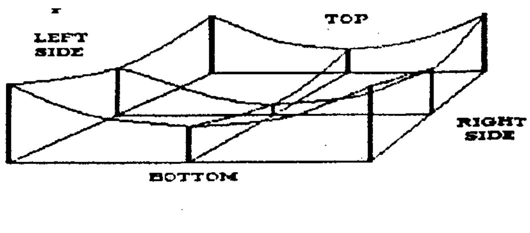
The TOP FOCUS control sets the focus voltage for the top and bottom of the picture.



The SIDE FOCUS sets thd focus voltages along the side of the picture.

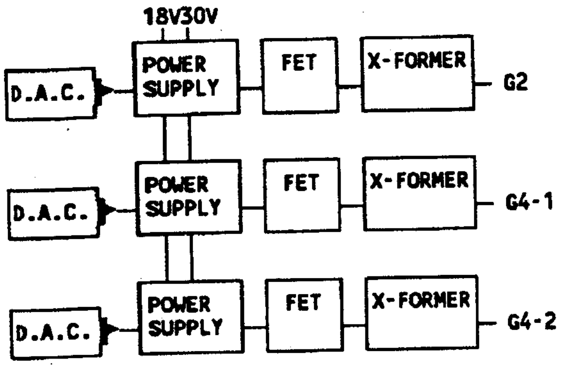


When both top and side focus voltages are adjusted the focus voltage is a complex wave form containing horizontal and vertical frequencies.



1) TUBE BIAS SUPPLIES

Little DC-DC converters power G2, G4-1 and G4-2.



3-5. VERTICAL DEFLECTION

The TDA 1675 incorporates all the necessary functions for providing the yoke of a monitor or television receiver with the current required for vertical deflection. Incorporated in silicon is a synchronizable oscillator, ramp generator, voltage regulator, voltage doubler and power

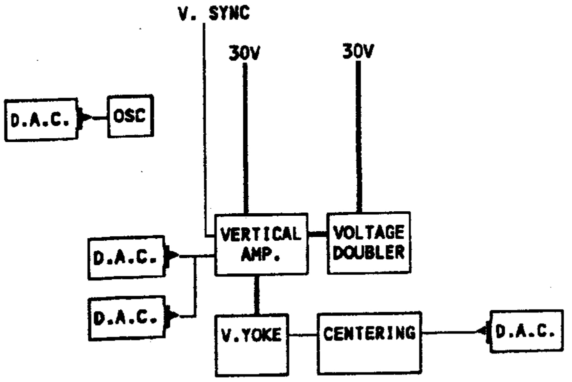


diagram 21

1) VERTICAL OSCILLATOR

The oscillator is an integrator (pins 4 to 3) and a two threshold comparator which switches pin 6 high or low to allow the charging of C362, C331 allows the charge and discharge ramps to have adjustable slopes. Vertical sync pulses come in on pin 5.

The V. Hold DAC sets the oscillator frequency.

2) RAMP GENERATOR

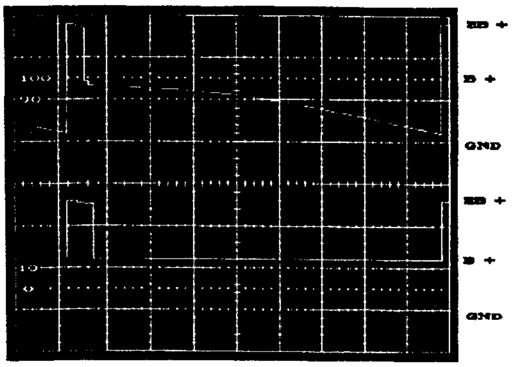
The ramp generator is made up of a current generator, controlled by current in pin 7, and the capacitor from pin 9 to ground. The slope, and thus the size of the linear ramp, is adjustable by setting the current pulled from pin 7.
This ramp also appears buffered on pin 10 at a much lower impedance. The size and shape of the ramp is modified by DACs.

3) VERTICAL POWER AMPLIFIER

A power amplifier, with input on pin 12, compares the ramp on pin 10 to the current ramp through the yoke. R302 and C365 stabilize the high gain power amplifier. Yoke current flows from pin 1, through the yoke, the DC blocking capacitor and a current sampling resistor to ground. Voltage which represents yoke current is then fed back to the input of the amplifier to be compared with the reference ramp.

The output stage of the power amplifier is supplied by the 30 volt supply during a trace, and by the vertical flyback generator circuit during a retrace.

The power output stage is thermally protected by sensing the junction temperature and shutting off the current source of the power stage.



4) VOLTAGE DOUBLER

In order to obtain sufficiently short flyback times, a voltage greater than that required during scanning must be applied to the yoke.

The flyback generator, during flyback only, supplies (to the power amplifier) a voltage equal to double the supply voltage. Pin 15 charges a capacitor up to the supply voltage during a trace and then sets this capacitor on top of the power supply during a retrace, thus doubling the available voltage.

5) VERTICAL LINEARITY

Vertical linearity is achieved by adjusting size many times down the screen.

6) VERTICAL CENTERING

A current source is connected to the cold side of the vertical yoke.
Transistor Q319 can pull DC current from the yoke causing the picture to move up the page. The DAC should be set to center the DATA vertically, not the raster, on the screen.

3-6. SYNC SEPARATOR

The video sync separator extracts timing information from the incoming composite video. Composite sync is found at the collector of Q201. If a signal is present on the composite/horizontal sync input then the sync from the video will be ignored.
Like wise if a signal is present on the vertical sync input then vertical sync from either composite sync or from video will be ignored.

1) COMPOSITE SYNC

Composite sync comes either from the TTL sync input or from composite video through the sync separator. A CMOS 'XOR' exclusive-or gate automatically restores sync polarity if necessary.

2) HORIZONTAL SYNC

Horizontal sync undergoes several stages of processing. See the sections on POLARITY RESTORATION, and DATA CENTERING.

3) VERTICAL SYNC

Vertical sync is detected by a low pass filter and an 'XOR' gate. Vertical sync comes from either the vertical/blanking input or the composite sync input.

4) BACK PORCH

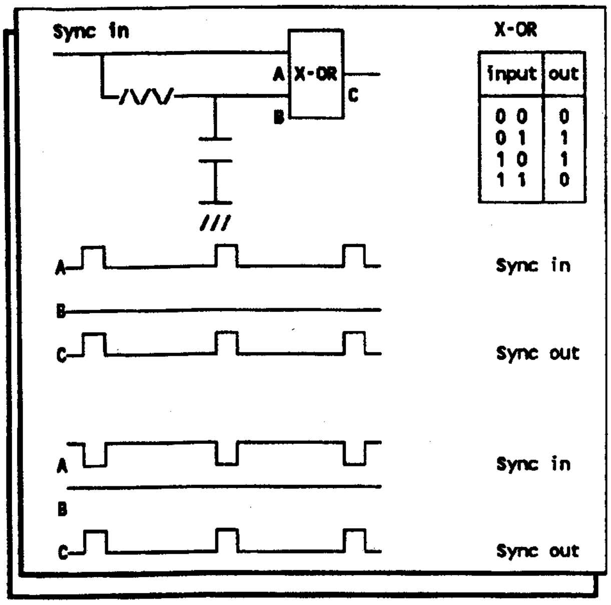
Back porch clamping pulses are created by detecting the trailing edge of sync. The width of this pulse should be a little shorter than the back porch. Half of the 74HC221 sets the pulse width of the back porch.

5) POLARITY RESTORATION

The polarity restoration circuit, an XOR gate, will restore sync polarity if it was fed inverted into the TTL sync input. The RC time constant in the low pass filter is about 0.1 second.

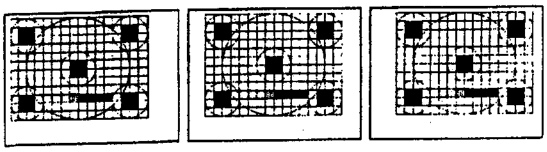
If the input is low with short positive pulses a low pass filter inputs a low to the XOR input B.

The output of the XOR gate will be the same as the input. Likewise if the input is high with short low going pulses the low pass filter will input a high to the B input of the XOR gate causing it to invert the sync. This way the syncs coming out of the polarity restoration circuit will always have short positive pulses except during vertical.



6) DATA CENTERING

The half of the 74HC221 on the video board is used for data centering. The one shot triggers with the leading edge of sync and time out with the back edge of the flyback pulse. Thedata centering DAC should be set to center the picture within the raster.



3-7. VIDEO

The video board is in the very back of the monitor. It contains the three video power amplifiers, three preamps and the sync processing circuits.

1) PREAMP

The LM1201 is a wide band video amplifier intended for use in high resolution monitors. The LM1201 contains a 200 MHz amplifier, driver, a black level clamp, a background level control and an 0 to 40 dB attenuator circuit for contrast.

A video preamplifier is AC coupled and biased through a resistor from a 2.4 volt reference. The preamplifier drives an attenuator whose gain is controlled by pin 4. The bias level is maintained by comparing the output of the attenuator with the voltage on pin 2. In the center of the LM1201 is a one transistor amplifier where the gain of each channel is matched to set white level. Another amplifier buffered by an emitter follower, brings the video out on pin 8.

2) CLAMP

The clamp input pin 6 watches the power amplifier's output during the back porch. Any difference in pin 9 and pin 6 during clamping will be amplified and used to drive a current source which modifies the voltage on pin 2. This clamp voltage will be used to set bias level.

3) LAY OUT

The LM1201 must be between two rows of high frequency capacitors which quickly return RF energy to ground. Component placement around the LM1201 is very critical in order to insure stability.

4) POWER VIDEO AMPLIFIER

The video output stage is made of a hybrid amplifier. The CR2424 is a wide band, large signal high slew rate amplifier. The output is capable if a 40 volt swing in less then 3 nS. A ±6.5mA input results in ±20 volts on the output.

Oscillation is hard to detect. The amplifier is capable of oscillations frequency higher than a 100MHz oscilloscope can detect.

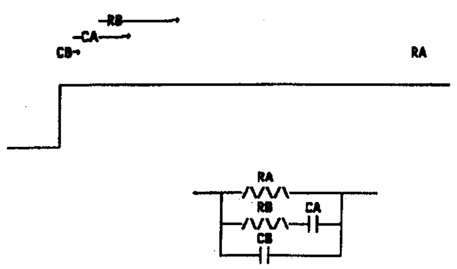
When viewing the output of the amplifier use a 100:1 low capacitance probe (1.5pF). Placing 10pF from a 10:1 probe on; the amplifier will slow down it's response.

5) PEAKING

Two types of video peeking are used to get the best video response. High band peeking is used to set the reponse of the first pixel or a single pixel. The mid-band peeking sets the response of pixels 2 through about 7.

Between the emitter follower and the video output amplifier are the video peeking components. At low frequency CA, CB and RB do not effect the circuit. The drive for low frequency signals, is sent by RA. At a high frequency determined by CB, the amount of drive is set by RA and RB in parallel. At a very high frequency CB increases the drive even more.

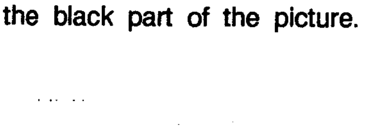
We have experience that the value of CB will be the same for all video power amplifiers with the same date code. Amplifiers made at a different time may require a different value.



6) CONTRAST & BRIGHTNESS

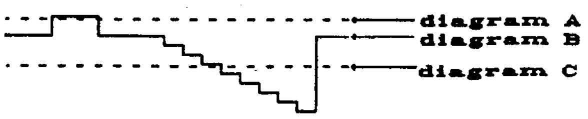
The contrast and brightness controls plug into the video board and adjust how the picture looks on the screen. The words "contrast" and "brightness" come from the television industry and are misnamed. In a television the "contrast" control does change the distance from black to white and the 'brightness' appears to change how bright the picture is. On a non-gray scale monitor, where the picture is black or white with no gray, the two controls are nearly impossible to tell apart. Over most the range they will do the same job. In critical applications like a gray scale monitor the controls function much differently then the names imply.

Below is the video wave form on the cathode of the CRT. The highest portion of the wave form represents the blackest part of the picture. As the wave gets lower the picture gets brighter. The three lines represent three different settings of the contrast control. The black level (at the top) stays stationary while the bright portions of the picture change intensity with the contrast control. If the user wants to make the picture 'brighter' or 'dimmer' then the contrast control should be adjusted not the brightness control.



Contrast adjustment

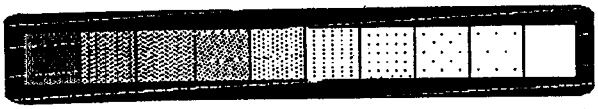
The 'brightness' control refers to the intensity of the black part of the picture.



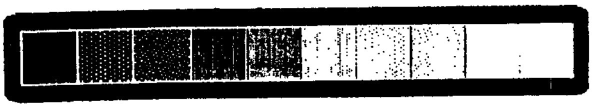
Black level adjustment

The brightness control should only be used to set the background to just disappear. This control should not be used to change the overall brightness. The next diagrams refer to three possible levels of brightness settings.

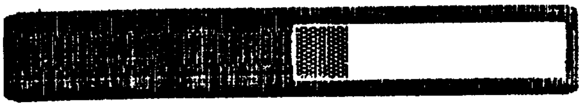
In A the background appears gray. Blacks are not black. The retrace lines appear in the background. Picture quality is poor.



At level B the background has just disappeared. Blacks are black. Low level grays can still be seen. This is the proper setting.



Level C results in the loss of many of the low levels of gray. Black is black but half of the gray levels are also black.



7) REGULATORS

Four voltages are used to run the video amplifier and sync processing circuit. The 180 volts is used to set black level. The 60 volts is used by the video power output amplifier. The 18 volts is reduced to 12 volts by the 7812 regulator for use by the LM1201s. Through a 7805 regulator all of the digital logic is powered.

8) PROTECTION

All elements of the tube have are protection. The arc current should be returned through the arc ground, not the signal ground, back to the tube in a short direct low impedance path.

9) BLACK LEVEL

The three cathodes are AC coupled to the video amplifiers. The DC on each cathode is set by a transistor and clamp diode. The value of the DC voltage is adjusted for black (no beam current).

10) FILAMENT

The filament is powered from -9 volts dropped by a power resistor.

3-8. TROUBLE SHOOTING

The block diagram should be used as a flow chart for trouble shooting. Nearly every piece of the monitor effects other pieces. Mark on the block diagram the pieces that are working and those that are not. By following the flow of effects, the problem can be pinpointed.

In some cases you may want to use a bench supply to inject 18 and 30 volts into the monitor. This will test a large piece of the monitor without applying A.C. power.

EXAMPLE: The horizontal switch appears not to work.
All the blocks above must be working first: *BASE DRIVE, PHASE LOCK LOOP, 12V REGULATOR, 18 AND 30 VOLTS, AND 180 VOLT SUPPLY.*

A process of elimination will show that if the vertical is running then the 30 volts is ok.

If the horizontal switch is not working then all items below would be effected: H.YOKE.

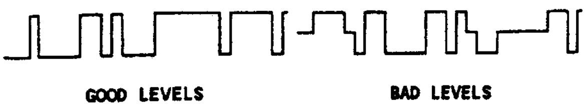
1) BRINGING UP THE MICRO COMPUTER

The micro is very complex, either it works or it does not. To test the micro attach a known working keyboard and apply 8 to 10 volts from a current limited bench supply to the 18 volts input. Test the 5 volt regulator. The LCD display should be working. The message should say something about no sync present. The low speed serial bus, pins 25 and 27, should send data to the LCD display.

If both horizontal and vertical sync (with in range) are sent to the micro then both data and clock, (pin 23 and 24) should respond. The micro should be trying to talk to the high speed DACs.

If the micro looks really dead test for a 2MHz square wave on pin 5, the clock output. The mode select pins 2 and 3 should be high to select external EPROM. The unused interrupt pins 18 and 19 should by high. The reset pin 17 must by high. In external EPROM mode pin 4 will pulse with every memory cycle. This is the signal that loads the low half of the address into the latch, 74HC373.

Sometimes two pins of the address or data buss get shorted together. This can be tested by looking at every pin on the EPROM. The pins should be toggling high/low. A trace to trace short may show three or more levels, high, middle and low.



A way to look for open traces is to touch the end of the oscilloscope probe with your finger. The scope will show 60Hz noise. With your finger still on the end of the probe connect to a trace that may be open. The logic on the micro board will pull the trace either high or low. If the trace is open then the 60Hz noise will still be present.

2) BRINGING UP THE POWER SUPPLY

Monitors and switching power supplies have the ability to destroy themselves. Here is a safe way to bring up the power supply.
Connect the power input to a 0 to 120 V.A.C. variac and isolation trasformer or a D.C. bench supply.
Apply 17 to 20 volts current limited to Vcc of IC602 (UC3844). Connect 1 watt loads to each of the output supply voltages.

IC602 pin 4 should have a sawtooth at about 200KHz. Pin 6 should have a square wave at 100kHz.

Apply 3 to 10 V.A.C. or D.C to the input of the switcher. The drain of Q604 will be at ground about 50% of the time and switch high for 50%.
Check each of the D.C. supplies for a few volts of output. This will test if D608 though D611 are functioning. If there appears to be too much power going into one of the supplies but you are not certain which supply or diode is shorted, try lifting each supply, one at a time, with a bench supply.

Set the 60 volt potentiometer for lowest voltage. Increase the input voltage slowly. Each supply should increase at the desired ration. If the 180 volt supply keeps climbing, above 180, with no limit test the error amplifier.

Disconnect the A.C. source. Connect a 18 volt power supply to the 18 volt output. The switcher should still be at maximum duty cycle. Lift up on the input of the TL431 error amplifier with a 6800 ohm resistor to 18 volts. The output of the TL431 should drop from 16 volts to 2.3 volts. Current will flow through the optocoupler's diode. The transistor side of the opto should lift it's emitter from ground to nearly the 5 volt supply feeding the collector. This will cause the switcher to have a 0% duty cycle.

3) BRINGING UP THE MONITOR

The monitor must be turned on with great care. If trouble is suspected, I suggest using current limited bench supplies for each supply voltage. Start by applying 18 volts. Test the 12 volt regulator and the oscillator on the PLL. Turn on the 30 volt supply and test the entire vertical section, the pin amp, base drive transformers and the chopper control logic. At this point the very heart if the monitor can be tester with out fear of high voltage or large currents.

Turn down the H. Size and High Voltage controls. Slowly apply the should 180 volt supply. Watch the flyback voltage on the Horizontal switch. The voltage should climb with increasing 180 volt supply. At the appropriate point the chopper should sense that the yoke current has reached the desired level and start to reduce the duty cycle keeping the flyback voltage constant.

The high voltage section is very similar to the horizontal. Plug in the flyback assembly and bring it up in the same manor as the horizontal section.

4) BRINGING UP THE VIDEO

Trouble shooting is made difficult by the fact that many things happen inside the video preamp that can not be seen. If no video is present test pin-16 for presents of video (AC) and bias (DC) from the reference pin-3

If the contrast control is set to minimum no video will be present. Check that the contrast control changes the voltage on pin-4.

There should be video on pin-16, pin-11, pin-8 and on pin-9.

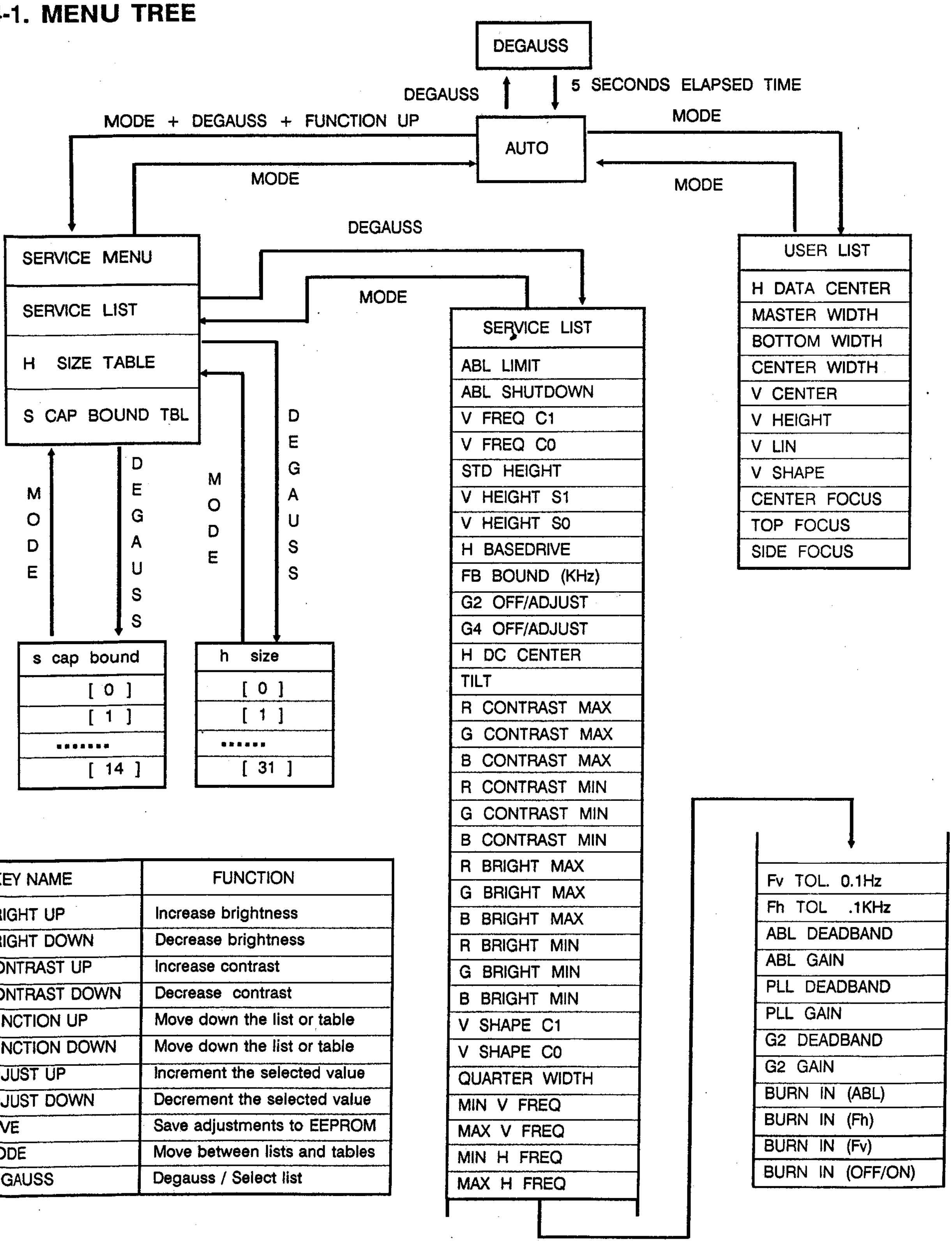
There must be clamping pulses coming in on pin-5 for the video to work! The preamp attempts to set the output of the video power amplifier to about 50 volts during blanking. If no blanking pulses are present the preamp will drive the video out of range.

During blanking the voltage on pin-9 and pin-6 should be the same. This indicates that the black level is correct.

The preamp or the power amplifier may be oscillating at 200MHz. This is hard to see on a 100MHz oscilloscope.

4. MONITOR CONTROL SOFTWARE

4-1. MENU TREE


DEGAUSS
DEGAUSS
5 SECONDS ELAPSED TIME
MODE + DEGAUSS + FUNCTION UP
AUTO
MODE
MODE
MODE
DEGAUSS
MODE
SERVICE MENU
SERVICE LIST
H SIZE TABLE
S CAP BOUND TBL
MODE
DEGAUSS
MODE
DEGAUSS
s cap bound
[0]
[1]
....
[14]
h size
[0]
[1]
......
[31]
SERVICE LIST
ABL LIMIT
ABL SHUTDOWN
V FREQ C1
V FREQ C0
STD HEIGHT
V HEIGHT S1
V HEIGHT S0
H BASEDRIVE
FB BOUND (KHz)
G2 OFF/ADJUST
G4 OFF/ADJUST
H DC CENTER
TILT
R CONTRAST MAX
G CONTRAST MAX
B CONTRAST MAX
R CONTRAST MIN
G CONTRAST MIN
B CONTRAST MIN
R BRIGHT MAX
G BRIGHT MAX
B BRIGHT MAX
R BRIGHT MIN
G BRIGHT MIN
B BRIGHT MIN
V SHAPE C1
V SHAPE C0
QUARTER WIDTH
MIN V FREQ
MAX V FREQ
MIN H FREQ
MAX H FREQ
USER LIST
H DATA CENTER
MASTER WIDTH
BOTTOM WIDTH
CENTER WIDTH
V CENTER
V HEIGHT
V LIN
V SHAPE
CENTER FOCUS
TOP FOCUS
SIDE FOCUS
Fv TOL. 0.1Hz
Fh TOL .1KHz
ABL DEADBAND
ABL GAIN
PLL DEADBAND
PLL GAIN
G2 DEADBAND
G2 GAIN
BURN IN (ABL)
BURN IN (Fh)
BURN IN (Fv)
BURN IN (OFF/ON)

KEY NAME	FUNCTION
BRIGHT UP	Increase brightness
BRIGHT DOWN	Decrease brightness
CONTRAST UP	Increase contrast
CONTRAST DOWN	Decrease contrast
FUNCTION UP	Move down the list or table
FUNCTION DOWN	Move down the list or table
ADJUST UP	Increment the selected value
ADJUST DOWN	Decrement the selected value
SAVE	Save adjustments to EEPROM
MODE	Move between lists and tables
DEGAUSS	Degauss / Select list

4-2. HOW TO ACCESS SERVICE MENU.

1). Press [MODE] key and then press [DEGAUSS] key while holding [MODE] key.
(Now you are pressing [MODE] & [DEGAUSS] key)

2). Press [FUNCTION UP] key and let it be free while holding [MODE] & [DEGAUSS] key.
Then LCD display will be changed.

```
SERVICE LIST
```

3). Remove your finger from the [MODE] & [DEGAUSS] key

4). Press [DEGAUSS] key once more. Then you will see the following message on the LCD.

```
   ABL  LIMIT
? / 0 ---> 254
```

5). You can select the service menu in this state by pressing [FUNCTION UP] or [FUNCTION DOWN] key. See the [MENU TREE] (page. 22)

4-3. DESCRIPTION OF ADJUSTMENTS IN USER & SERVICE MODE

It would be needed to know what to adjust in the various condition of the monitor. This section will offer you the information about turning adjustments.

TUNING ADJUSTMENTS

ADJUSTMENT NAME: H DATA CENTER
RANGE: -127 TO +127
DESCRIPTION: Moves the picture within the raster.

ADJUSTMENT NAME: TILT
RANGE: -127 TO +127
DESCRIPTION: Tilts the vertical left or right to make vertical lines perpindicular.

ADJUSTMENT NAME: MASTER WIDTH
RANGE: 0 to 255
DESCRIPTION: Sets the width horizontal size of the picture.

ADJUSTMENT NAME: BOTTOM WIDTH
RANGE: -127 to +127
DESCRIPTION: Sets the width at the bottom of the picture.

ADJUSTMENT NAME: CENTER WIDTH
RANGE: -127 to +127
DESCRIPTION: Sets the width at the center of the picture.

ADJUSTMENT NAME: QUARTER WIDTH
RANGE: -127 to +127
DESCRIPTION: Sets the width at one quarter and three quarters of the distance down the picture.

ADJUSTMENT NAME: CW SLOPE
RANGE: -127 to +127
DESCRIPTION: Compensates CENTER WIDTH, QUARTER WIDTH and TILT for height,. This is set with V HEIGHT not equal to 0.

ADJUSTMENT NAME: V CENTER
RANGE: -127 to +127
DESCRIPTION: Moves the picture and raster up and down.

ADJUSTMENT NAME: V HEIGHT
RANGE: -127 to +127
DESCRIPTION: Controls the height of the picture.

ADJUSTMENT NAME : V LIN
RANGE: -127 to +127
DESCRIPTION: Controls the height of the top half of the picture relative to the height of the bottom half.

ADJUSTMENT NAME : V SHAPE
RANGE: -127 to +127
DESCRIPTION: Fine control of the height of a square at the center of the picture relative to the height of a square at the top and bottom.

ADJUSTMENT NAME: V SHAPE 0
RANGE: -127 to +127
DESCRIPTION: Controls the height of a square at the center of the picture relative to the height of a square at the top and bottom. Adjust with vertical frquency at MIN V FREQ and V SHAPE at 0.

ADJUSTMENT NAME: V SHAPE 1
RANGE: -127 to +127
DESCRIPTION: Controls the height of a square at the center of the picture relative to the height of a square at the top and bottom. Adjust with vertical frequency at MAX V FREQ and V SHAPE at 0.

ADJUSTMENT NAME: CENTER FOCUS
RANGE: 0 to 255
DESCRIPTION: Focuses the center of the picture.

ADJUSTMENT NAME: TOP FOCUS
RANGE: 0 to 255
DESCRIPTION: Focuses the top center and bottom center of the picture.

ADJUSTMENT NAME: SIDE FOCUS
RANGE: 0 to 255
DESCRIPTION: Focuses the sides of the picture.

ADJUSTMENT NAME: H BASEDRIVE
RANGE: 0 to 63
DESCRIPTION: Controls performance of horizontal deflection.

ADJUSTMENT NAME: FB BOUND KHz
RANGE: MIN Fh to MAX Fh
DESCRIPTION: This is a horizontal frequency in KHz. Below this frequency, select a slow flyback time. Above this frequency, select a fast flyback time.

ADJUSTMENT NAME:G2 OFF ADJUST
RANGE: 0 to 63
DESCRIPTION: Controls the master brightness.

ADJUSTMENT NAME: G4 OFF ADJUST
RANGE: 0 to 63
DESCRIPTION: Coarse focus adjustment

ADJUSTMENT: H DC CENTER
RANGE: -127 to +127
DESCRIPTION: Moves the raster left and right.

ADJUSTMENT NAME : R CONTRAST MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Red gain at maximum contrast.

ADJUSTMENT NAME : G CONTRAST MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Green gain at maximum contrast.

ADJUSTMENT NAME: B CONTRAST MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Blue gain at maximum contrast.

ADJUSTMENT NAME: R CONTRAST MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Red gain at minimum contrast.

ADJUSTMENT NAME: G CONTRAST MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Green gain at minimum contrast.

ADJUSTMENT NAME: B CONTRAST MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Blue gain at minimum contrast.

ADJUSTMENT NAME: R BRIGHT MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Red black level at maximum brightness.

ADJUSTMENT NAME: G BRIGHT MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Green black level at maximum brightness.

ADJUSTMENT NAME: B BRIGHT MAX
RANGE: 0 to 255
DESCRIPTION: The value of the Blue black level at maximum brightness.

ADJUSTMENT NAME: R BRIGHT MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Red black level at minimum brightness.

ADJUSTMENT NAME: G BRIGHT MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Green black level at minimum brightness.

ADJUSTMENT NAME: B BRIGHT MIN
RANGE: 0 to 255
DESCRIPTION: The value of the Blue black level at minimum brightness.

ADJUSTMENT NAME: ABL LIMIT
RANGE: 0 to 255
DESCRIPTION: Sets the maximum beam current level before contrast is automatically decremented. ABL LIMIT must be less than ABL SHUTDOWN.

ADJUSTMENT NAME: ABL SHUTDOWN
RANGE: -127 to +127
DESCRIPTION: Sets the maximum beam current level before the monitor goes into safety shutdown. ABL SHUTDOWN must be greater than ABL LIMIT.

ADJUSTMENT NAME: V FREQ C1
RANGE: 0 to 31
DESCRIPTION: Controls the value of the vertical hold at MAX V FREQ.

ADJUSTMENT NAME: V FREQ C0
RNAGE: 0 to 31
DESCRIPTION: Controls the value of the vertical hold at MIN V FREQ.

ADJUSTMENT NAME: V HEIGHT S1
RANGE: -127 to +127
DESCRIPTION: Controls vertical height at MAX V FREQ.

ADJUSTMENT NAME: V HEIGHT S0
RANGE: -127 to +127
DESCRIPTION: Controls vertical height at MIN V FREQ.

ADJUSTMENT NAME: BURN IN
RANGE: 0 (OFF) to 1 (ON)

DESCRIPTION: Turn on to display a raster with no syncs or video. The Vertical blanking signal substitutes for Vsync. When BURN IN is on, BURN IN Fv, BURN IN Fh and BURN IN ABL are active.

ADJUSTMENT NAME: BURN IN Fv
RANGE: 0 to 63
DESCRIPTION: When BURN IN is on, BURN IN Fv directly sets the Vertical frequency DAC.

ADJUSTMENT NAME: BURN IN Fh
RANGE: 0 to 63.
DESCRIPTION: When BURN IN is on, BURN IN Fh directly sets the horizontal frequency DAC and the horizontal PLL servo is disabled.

ADJUSTMENT NAME: BURN IN ABL
RANGE: 0 to 255
DESCRIPTION: When BURN IN is on, BURN IN ABL specifies a beam current to acheive. Contrast and Brightness are set to maximum and a servo adjusts G2 to keep the digitized ABL equal to BURN IN ABL. BURN IN ABL must be less than BURN IN LIMIT so the two servos do not fight each other.

ADJUSTMENT NAME: PLL GAIN
RANGE: 1 to 120
DESCRIPTION: The gain applied to the PLL error signal in the horizontal hold system.

ADJUSTMENT NAME: PLL DEADBAND
RANGE: 1 to 120
DESCRIPTION: Once horizontal hold is achieved, the PLL error must be outside of this deadband before the horizontal hold DAC is updated.

ADJUSTMENT NAME: G2 GAIN
RANGE: 1 to 120
DESCRIPTION: In the burn mode, a servo adjusts G2 to keep ABL at a constant level. This is the servo gain.

ADJUSTMENT NAME: G2 DEADBAND
RANGE: 1 to 120
DESCRIPTION: In the burn mode, a servo adjusts G2 to keep ABL at a constant level. If the error is less than the deadband then don't update G2.

ADJUSTMENT NAME: ABL GAIN
RANGE: 1 to 120
DESCRIPTION: The gain of the feedback loop which adjusts CONTRAST to keep ABL below the ABL LIMIT.

ADJUSTMENT NAME: ABL DEADBAND
RANGE: 1 to 120
DESCRIPTION: The deadband of the feedback loop which adjusts CONTRAST to keep ABL below the ABL LIMIT.

ADJUSTMENT NAME: MIN V FREQ
RANGE: 40 to 125
DESCRIPTION: The minimum vertical frequency the monitor will sync to.

ADJUSTMENT NAME: MAX V FREQ
RANGE: 40 to 125
DESCRIPTION: The maximum vertical frequency the monitor will sync to.

ADJUSTMENT NAME:MIN H FREQ
RANGE: 25 to 135
DESCRIPTION: The minimum horizontal frequency the monitor will sync to.

ADJUSTMENT NAME: MAX H FREQ
RANGE: 25 to 135
DESCRIPTION: The maximum horizontal frequency the monitor will sync to.

ADJUSTMENT NAME: Fv TOL. 0.1Hz
RANGE: 0 to 255
DESCRIPTION: Fv TOL. is the tolerance for the vertical frequency.

ADJUSTMENT NAME: Fh TOL. .1KHz
RANGE: 0 to 30
DESCRIPTION: Fh tol. is the tolerance for the horizontal frequency.

4-4. THE INITIAL DATA OF ADJUSTMENTS

1) μ-PROCESSOR EEPROM INITIAL DATA (V 1.04)

It is needed to set up initial value of adjustments before the alignment. So, the following data must be put to the EEPROM of u-processor before you start adjustment.

USER LIST	VALUE	SERVIDE LIST	VALUE	SERVICE LIST	VALUE
H DATA CENTER	-44	ABL LIMIT	60	H DC CENTER	10
MASTER WIDTH	116	ABL SHUTDOWN	254	TILT	0
BOTTOM WIDTH	0	V FREQ C1	15	R CONTRAST MAX	220
CENTER WIDTH	27	V FREQ C0	10	R CONTRAST MAX	220
V CENTER	-11	STD HEIGHT	0	B CONTRAST MAX	220
V HEIGHT	47	V HEIGHT S1	-38	R CONTRAST MIN	0
V LIN	-25	V HEIGHT S0	17	G CONTRAST MIN	0
V SHAPE	0	H BASEDRIVE	35	B CONTRAST MIN	0
CENTER FOCUS	56	FB BOUND	62	R BRIGHT MAX	155
TOP FOCUS	188	G2 OFF/ADJUST	37	G BRIGHT MAX	155
SIDE FOCUS	77	G4 OFF/ADJUST	28	B BRIGHT MAX	155

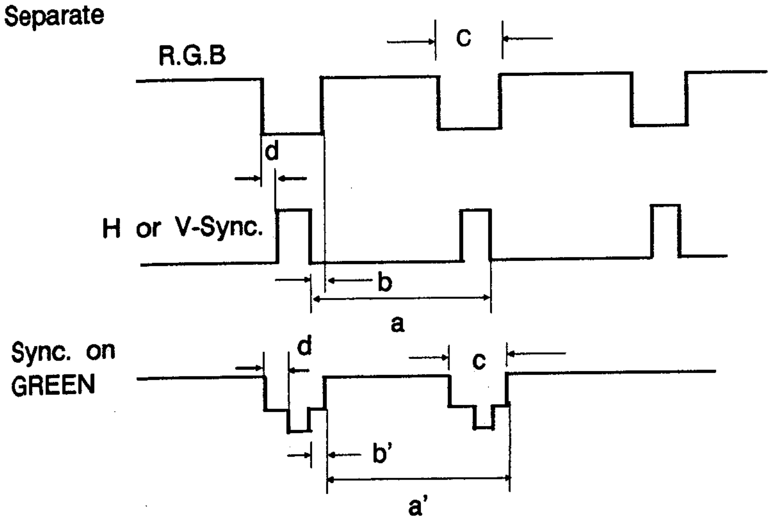
SERVICE LIST	VALUE	SERVICE LIST	VALUE	S CAP BND TABLE			
R BRIGHT MIN	90	ABL GAIN	1	0	81	11	52
G BRIGHT MIN	90	PLL DEADBAND	60	1	76	12	50
B BRIGHT MIN	90	PLL GAIN	120	2	73	13	47
V SHAPE C1	-46	G2 DEADBAND	10	3	71	14	45
V SHAPE C0	47	G2 GAIN	8	4	66		
QUARTER WIDTH	0	BURN IN (ABL)	20	5	62		
MIN V FREQ	45	BURN IN (Fh)	31	6	60		
MAX V FREQ	90	BURN IN (Fv)	31	7	56		
MIN H FREQ	45	BURN IN (OFF/ON)	0	8	56		
MAX H FREQ	90	Fh TOL (100Hz)	15	9	56		
ABL DEADBAND	8	Fv TOL (10mHz)	50	10	54		

2) USER SAVE

The "USER SAVE" (Saving in the user mode) searches the table for a matching frequency pair. If found, then update the matching entry in the user mode table.
If no match is found, then create a new entry in the user mode table and save the frequencies along with the four settings. If the table is full, then overwrite at the first entry in the table.
20 frequency pairs and four settings in the service menu. USER MODE TABLE, and four channel of that is preset in the factory as follows.

	CHANNEL	0	1	2	3
	Fh (KHz)	57.982	63.702	74.728	76.968
	Fv (Hz)	72.12	60.10	60.02	71.93
Horizontal (μs)	a	17.247	15.698	13.382	12.992
	b	2.078	1.811	2.036	2.045
	c	3.948	3.623	3.297	3.368
	d	0.208	0.453	0.194	0.120
Vertical (ms)	a	13.866	16.639	16.661	13.902
	b	0.414	0.471	0.375	0.494
	c	0.621	0.565	0.589	0.598
	d	0.086	0.047	0.067	0.013

Timing chart

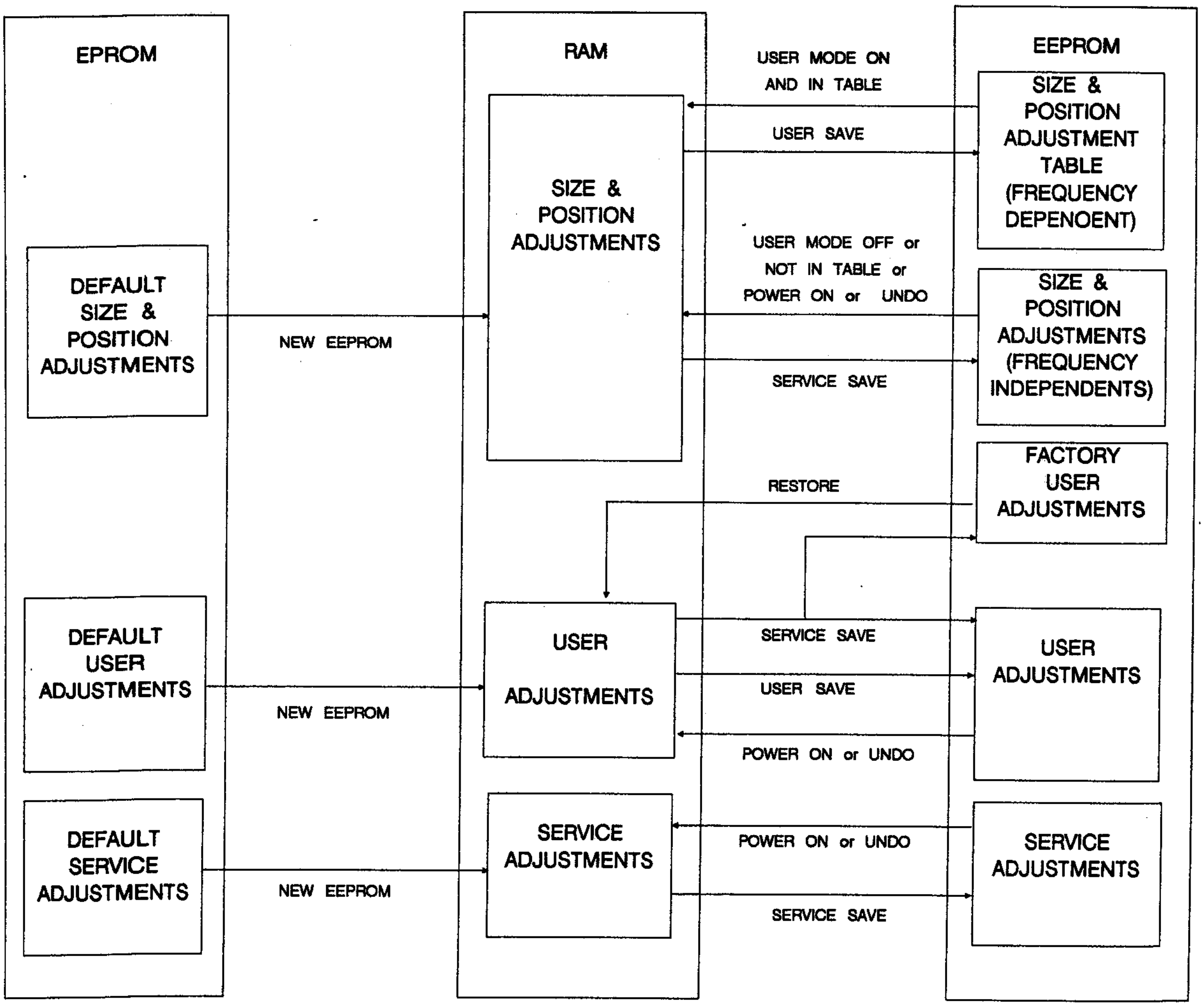


where,
a: one period of H or V-sync. (separate)
a' : one period of H or V-sync. (sync on green)
b, b' : back porch
c, c' : Blanking time
d, d' : Front porch

3) USER MODE TABLE

The user mode table allows a user to save different values of [V HIGHT], [MASTER WIDTH], [V CENTER], and [H DATA CENTER] for each unique Fv, Fh pair. The user mode table can be turned off during factory adjustment and service so the same values are used for each Fv, Fh pair.
When valid Fv and Fh signals are detected, look in the table for a matching frequency pair. If a match occurs, then set [V HEIGHT], [MASTER WIDTH], [V CENTER], and [H DATA CENTER] from the table. Otherwise, set from the service menu.

ADJUSTMENT TABLES - RAM, EEPROM and EPROM


EPROM
RAM
EEPROM
USER MODE ON AND IN TABLE
USER SAVE
SIZE & POSITION ADJUSTMENT TABLE (FREQUENCY DEPENOENT)
SIZE & POSITION ADJUSTMENTS
USER MODE OFF or NOT IN TABLE or POWER ON or UNDO
DEFAULT SIZE & POSITION ADJUSTMENTS
NEW EEPROM
SIZE & POSITION ADJUSTMENTS (FREQUENCY INDEPENDENTS)
SERVICE SAVE
RESTORE
FACTORY USER ADJUSTMENTS
DEFAULT USER ADJUSTMENTS
USER ADJUSTMENTS
SERVICE SAVE
USER SAVE
USER ADJUSTMENTS
NEW EEPROM
POWER ON or UNDO
DEFAULT SERVICE ADJUSTMENTS
SERVICE ADJUSTMENTS
POWER ON or UNDO
SERVICE ADJUSTMENTS
NEW EEPROM
SERVICE SAVE

This diagram shows the monitor adjustments in RAM, EEPROM and EPROM. the labeled arrows show the conditions for copying from one block of memory to another.
When the USER MODE is on, each uniquen frequency pair has its own size and position controls. When the USER MODE is off, all frequency pairs use the same size and position controls.
A new 68HC11, as shipped from the factory, has 255 in all EEPROM locations. When this condition is detected, the EEPROM is initialized with default values from EPROM.

5. ABBREVIATION

ABL : Automatic Brightness Limit
AC : Alternating Current
ADC : Analog to Digital Converter
AMP : Amplifier

B : Blue
BRT : Brightness

C : Capacitor
CMOS:Complementary MOS
CPU : Centeral Processing Unit
CRT : Cathod Ray Tube

D : Diode
DAC : Digital to Anaolog Converter

EPROM : Erasable Programmable ROM
EEPROM : Electrically Erasable Programmable ROM

FBT : Fly Back Transformer
FET : Field Effect Transistor

G : Green

H : Horizontal

IC : Integrated Circuit.

LCD : Liquid Crystal Display
LIN : Linearity

MOSFET : Metal-oxide Semiconductor FET

OSC : Oscillator

PIO : Parallel Input/output
PLL : Phase Locked Loop
PWM : Pulse Width Modulator

R : Resistor
RMS : Route-Mean Square

SCI : Serial Communication Interface
SPI : Serial Peripheral Interface
SW : Switch
SYNC: Synchronization Pulse

T : Transformer
TTL : Transistor-Transistor Logic

VOM : Voltage Meter
VTG : Voltage

ALIGNMENT PROCEDURE

1. MEASURING INSTRUMENTS FOR ADJUSTMENT

NO.	INSTRUNMENT	MODEL	Q'TY	REMARK
1	TEMPLATE JIG OR PLASTIC RULER		1	FOR CSC1677
2	COLOR ANALYZER	CA-100	1	
3	SIGNAL GENERATOR	CHROMA2000 OR EQUIVALENT	1	
4	DIGITAL MULTI METER		1	
5	HIGH VOLTAGE PROBE		1	
6	OSCILLOSCOPE		1	
7	OSCILLOSCOPE PROBE		2	100:1, 10:1

2. ADJUSTMENT CONDITIONS & PRECAUTIONS

- Power supply voltage : AC 110V/220V selectable.

- Warm up time : This monitor must be warmed up for at least 30minutes before starting alignment.

- Video signal : Analog 0.7Vp-p (separate), 1.0Vp-p (composite) with 75ohm terminated.

- Sync : Sync on Green / H/V composite/separate.
  Positive/Negative

- Scanning frequency : (H) 45KHz - 85KHz (separate, H/V composite)
  45KHz - 70KHz (Sync on green)
  (V) 45Hz - 90Hz.

3. INPUT TIMING FORMAT OF CHROMA-2000

	1	2	3	4	5	6
PIXEL(MHz)	77	106.000	165.008	133.008	200	36
H(KHz)	57.982	63.702	74.732	76.972	88.028	45
V(Hz)	72.207	60.153	60.074	72.004	45.004	90
INTERLACE MODE	NO	NO	NO	NO	NO	NO
OUTPUT SIGNAL	ANALOGUE	ANALOGUE	ANALOGUE	ANALOGUE	ANALOGUE	ANALOGUE
Vpp	1.00	1.00	1.00	1.00	1.00	1.00
SYNC ON	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN
UNIT OF DATA	PIXEL	PIXEL	PIXEL	PIXEL	PIXEL	PIXEL
FRAME BORDER						
H	0	0	0	0	0	8
V	0	0	0	0	0	8
H TOTAL SIZE	1328	1664	2208	1728	2272	800
H DISPLAY SIZE	1024	1280	1664	1280	1600	640
REAR PORCH	160	192	336	272	260	44
H SYNC. WIDTH	128	144	176	160	370	96
SYNC POLARITY	-	-	-	-	+	-
V TOTAL SIZE	803	1059	1244	1069	1956	500
V DISPLAY SIZE	768	1024	1201	1024	1850	470
V REAR PORCH	24	30	28	38	65	23
V SYNC. WIDTH	7	3	11	7	5	2
SYNC POLARITY	-	-	-	-	+	-
WITH EQUALIZED	NO	NO	NO	NO	NO	NO
SERRATION	NO	NO	NO	NO	NO	NO
COMPOSITE SYNC POLARITY	-	-	-	-	+	-

4. SMPS B+ ADJUSTMENT

Adjust VR601 to be 60V ±0.5V DC.

5. ANODE VOLTAGE ADJUSTMENT

1) Increase CONTRAST, BRIGHT to be max.
2) Connect the (-) pole of high voltage probe to the chassis ground, (+) pole to the ANODE CAP.
3) Adjust VR502 to be 27kV ±0.1KV.

6. H-SIZE & H-LIN (PATTERN #51: CHROSS HATCH)

1) Increase BRIGHT to be MAX.
2) Adjust [H DC CENTER] so that the back raster locate in the center.
3) Adjust [H DATA CENTER] so that the data area locate in the center on the back raster.
4) Adjust [MASTER WIDTH] to get the best H-Linearity.
5) Adjust the linearity coil (L402) to be the best H-Linearity.
6) Check again whether the [H CENTER] and [H-SIZE] of the picture is spec-in. If not, repeat 2-5.

7. V-SIZE (PATTERN #51: CROSS HATCH)

1) Adjust the vertical center with [V-CENTER].
2) Adjust the vertical size with [V-SIZE].

8. V-LIN (PATTERN #51: CROSS HATCH)

1) Adjust [V-SHAPE] and [V-LIN] to be the best V-Linearity.
2) The differencies between [V-SHAPE] and [V-LIN] is shown page 24.

9. SIDE PINCUSHION (PATTERN #51: CROSS HATCH)

1) Adjust [CENTER WIDTH] to make the sides straight.

10. WHITE BALANCE ADJUSTMENT (PATTERN #2: FULL WHITE)

1) Adjust BRIGHT to be MAX., CONTRAST to be MIN.
2) Adjust [G(2) OFF/ADJUST] so that the Luminance is 1.5 - 2Ft/L.
3) Adjust R(G,B) BRT MAX in service menu to be as follows (x=0.281 +/-0.02 y=0.311 +/-0.02).
4) Repeat 2,3 for the COLOR COORDINATE to be as follows while the Luminance is 2Ft/L.
5) Decrease BRIGHT to be 0.5Ft/L and adjust R(G,B) BRT MIN to make white balance good. (X=0.281 +/-0.02, Y=0.311 +/-0.02)
6) Increase BRIGHT to be MAX, check that white balance is spec-in. (X=0.281 +/-0.02, Y=0.311 +/-0.02) If not, repeat 2) - 5)
7) Decrease BRIGHT until the picture disappears (to the cut-off level), increase CONTRAST to be MAX.
8) Adjust white balance with R(G,B) CONT MAX.
9) Decrease CONTRAST to be 1.0Ft/L, adjust white balance with R(G,B) CONT MIN.
10) Check that white balance is spec-in varying CONTRAST, BRIGHT. If not, repeat 1) ~ 9).

11. ABL ADJUSTMENT (PATTERN #2: FULL WHITE)

1) Increase BRIGHT, CONTRAST to be MAX. (In this case, CONTRAST is automatically decreased.)
2) Adjust [ABL LIMIT] to be 24Ft/L.

12. PEAKING (PATTERN #51: CROSS HATCH)

1) Decrease [BRIGHT] to be MIN.
2) Disconnect G.B signal cable while R,H,V signal cabl is connected.
3) Increase [CONTRAST] to be MAX, decrease [G2 OFF/ADJUST] until the picture disappears.
4) Adjust varying condensor (C170) so that horizontal and vertical line disappears at the same time as varing [BRIGHT].
5) Disconnect "R" and connect "G".
6) Repeate 3), 4) controlling not C170 but C140.
7) Disconnect "G" and connect "B".
8) Repeate 3), 4) adjusting C110.
9) Connect "R" and "G" signal cable.
10) Check that the horizontal and vertical line disappears at the same time as varying BRIGHT, if not, repeat 1) ~ 8).

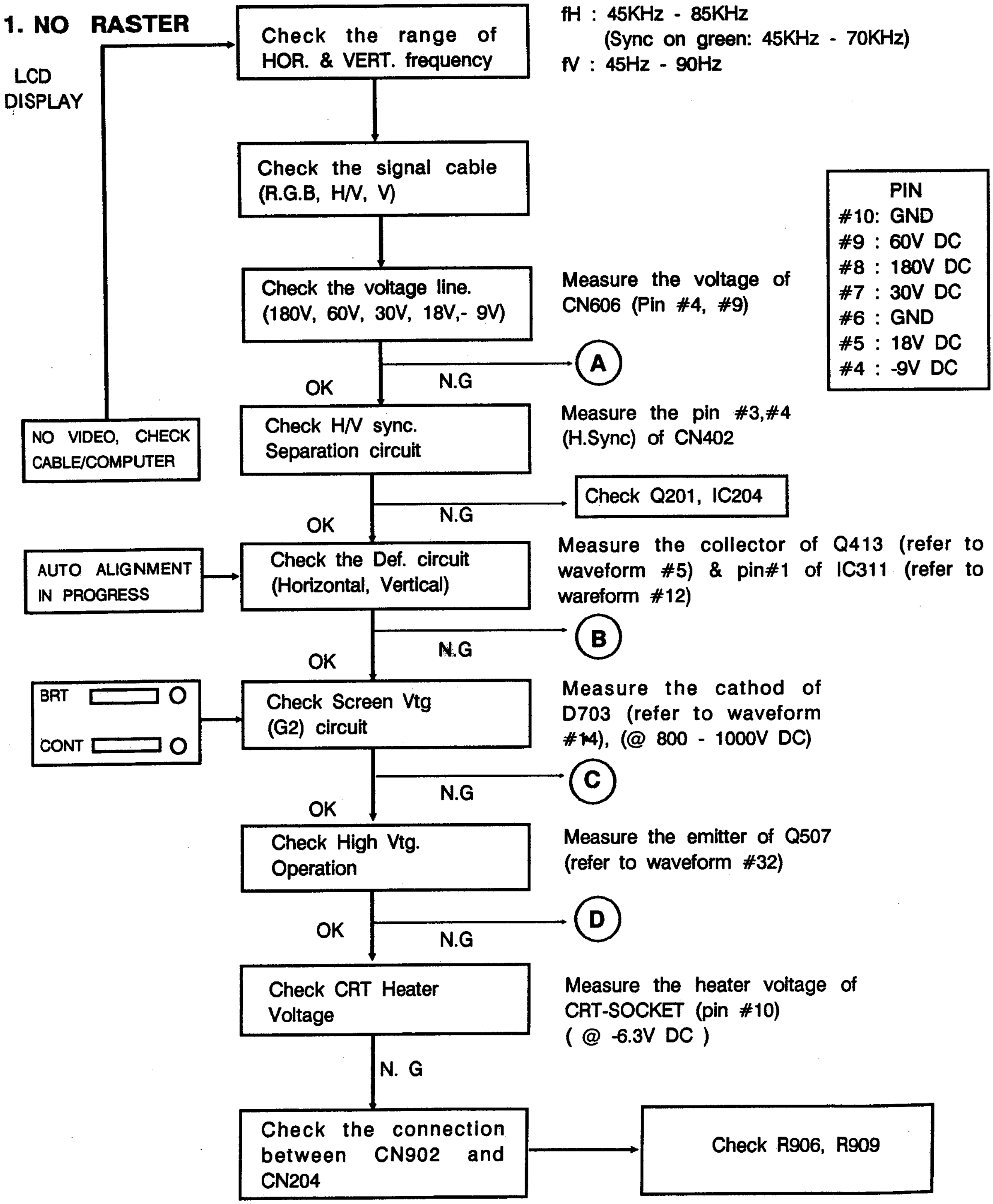
CAUTION: Peaking adjustment depends on the characteristics of input signal. So BUFFER or must not be used when using CHROMA-2000.

13. FOCUS ADJUSTMENT.

1) Decrease BRIGHT to be cut-off level, adjust CONTRAST to be 15 Ft/L.
2) Change the pattern of signal generator from "FULL WHITE" to "CHARACTER".
3) Adjust FOCUS VR located in FBT to make the focus good.
4) Adjust [CENTER FOCUS], [TOP FOCUS], [SIDE FOCUS] to be the best state.

TROUBLE SHOOTING

1. NO RASTER


LCD DISPLAY
Check the range of HOR. & VERT. frequency
Check the signal cable (R.G.B, H/V, V)
Check the voltage line. (180V, 60V, 30V, 18V,- 9V)
OK
N.G
A
NO VIDEO, CHECK CABLE/COMPUTER
Check H/V sync. Separation circuit
OK
N.G
Check Q201, IC204
AUTO ALIGNMENT IN PROGRESS
Check the Def. circuit (Horizontal, Vertical)
OK
N.G
B
BRT
CONT
Check Screen Vtg (G2) circuit
OK
N.G
C
Check High Vtg. Operation
OK
N.G
D
Check CRT Heater Voltage
N. G
Check the connection between CN902 and CN204
Check R906, R909

fH : 45KHz - 85KHz
(Sync on green: 45KHz - 70KHz)
fV : 45Hz - 90Hz

PIN
#10: GND
#9 : 60V DC
#8 : 180V DC
#7 : 30V DC
#6 : GND
#5 : 18V DC
#4 : -9V DC

Measure the voltage of CN606 (Pin #4, #9)

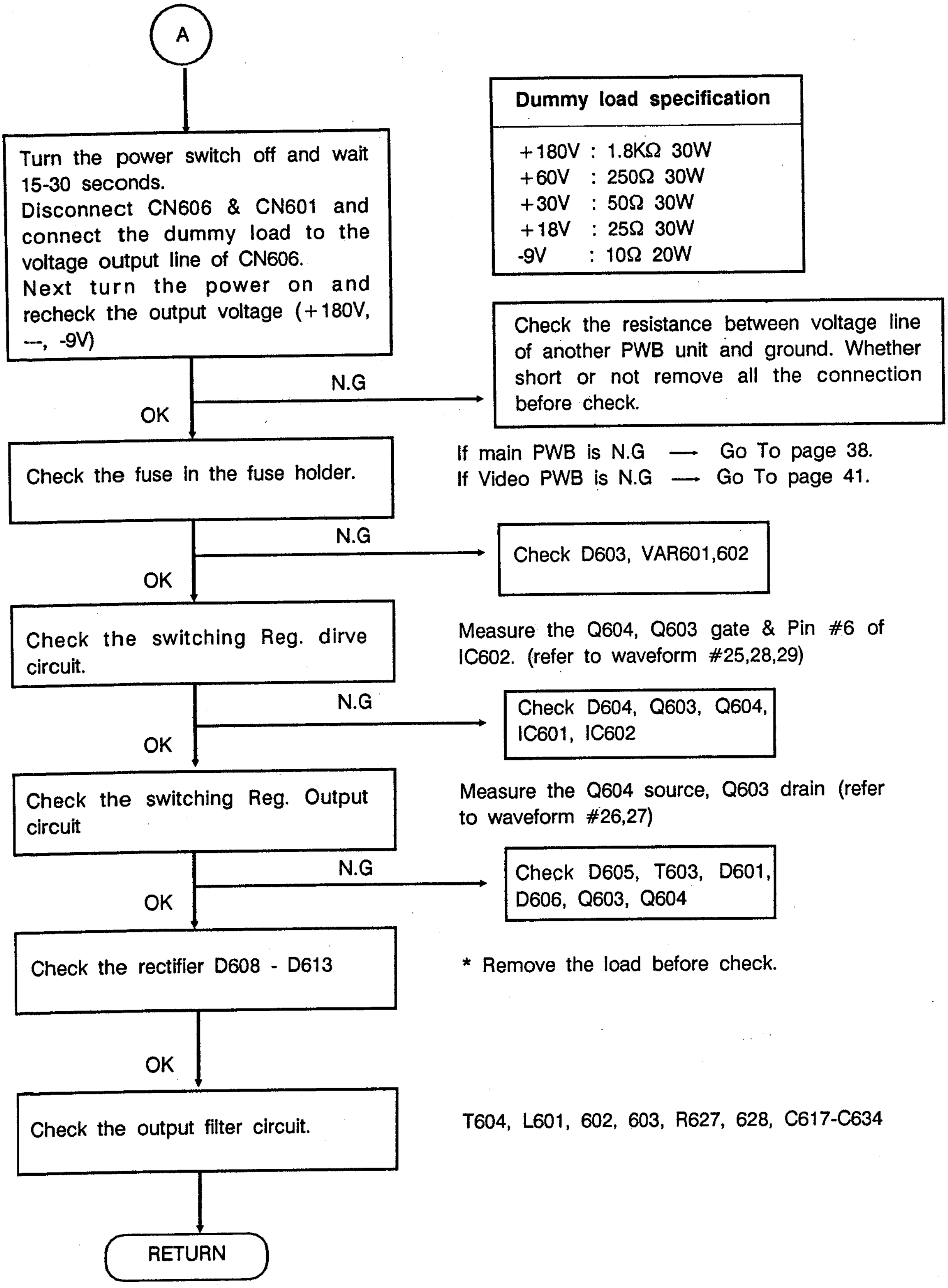
Measure the pin #3,#4 (H.Sync) of CN402

Measure the collector of Q413 (refer to waveform #5) & pin#1 of IC311 (refer to wareform #12)

Measure the cathod of D703 (refer to waveform #14), (@ 800 - 1000V DC)

Measure the emitter of Q507 (refer to waveform #32)

Measure the heater voltage of CRT-SOCKET (pin #10)
(@ -6.3V DC)



Turn the power switch off and wait 15-30 seconds.
Disconnect CN606 & CN601 and connect the dummy load to the voltage output line of CN606.
Next turn the power on and recheck the output voltage (+180V, ---, -9V)

Dummy load specification

+180V : 1.8KΩ 30W
+60V : 250Ω 30W
+30V : 50Ω 30W
+18V : 25Ω 30W
-9V : 10Ω 20W

Check the resistance between voltage line of another PWB unit and ground. Whether short or not remove all the connection before check.

If main PWB is N.G ⟶ Go To page 38.
If Video PWB is N.G ⟶ Go To page 41.

Check the fuse in the fuse holder.

Check D603, VAR601,602

Check the switching Reg. dirve circuit.

Measure the Q604, Q603 gate & Pin #6 of IC602. (refer to waveform #25,28,29)

Check D604, Q603, Q604, IC601, IC602

Check the switching Reg. Output circuit

Measure the Q604 source, Q603 drain (refer to waveform #26,27)

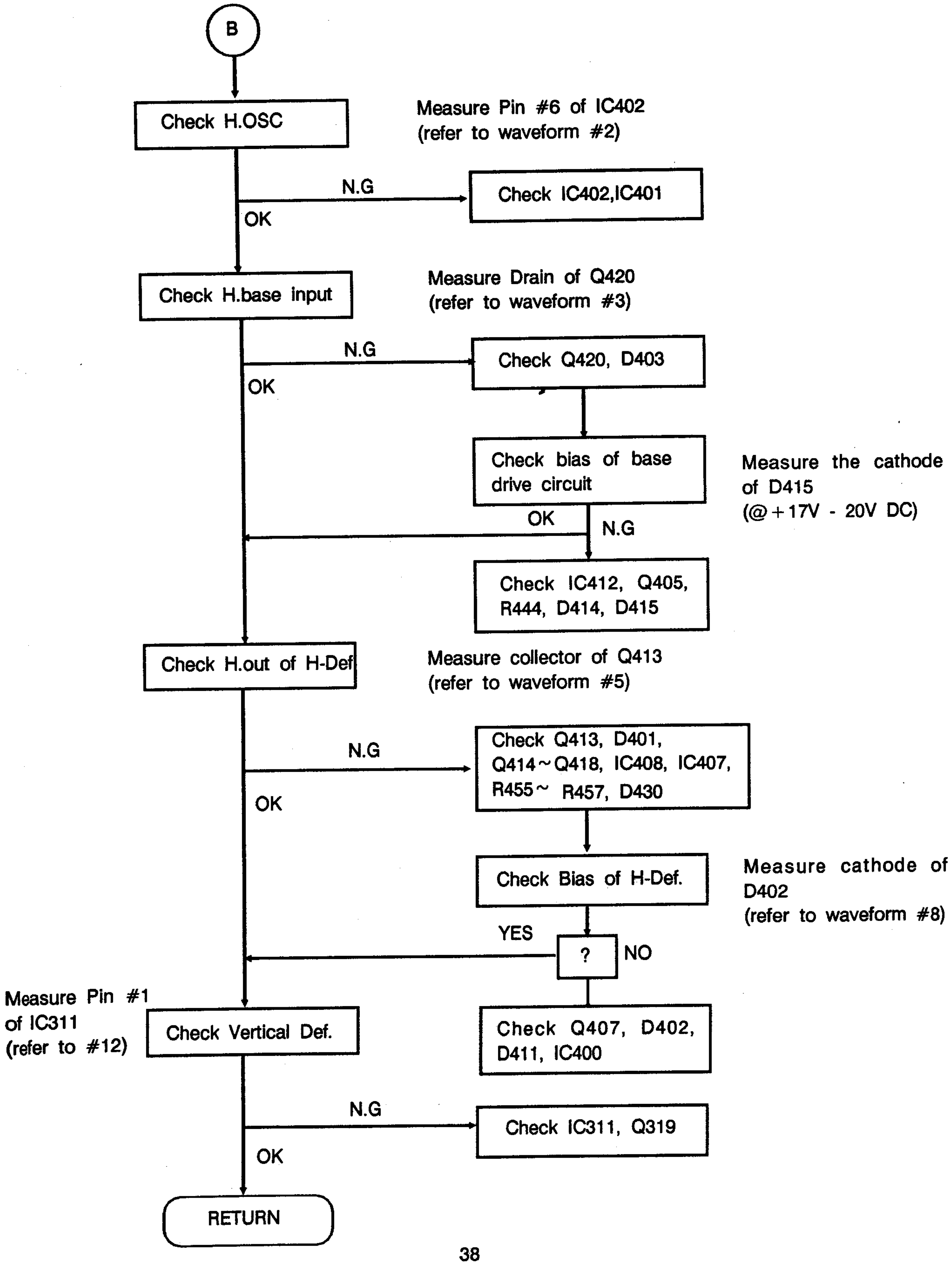
Check D605, T603, D601, D606, Q603, Q604

Check the rectifier D608 - D613

* Remove the load before check.

Check the output filter circuit.

T604, L601, 602, 603, R627, 628, C617-C634


B
Check H.OSC
N.G
OK
Check IC402,IC401
Check H.base input
N.G
OK
Check Q420, D403
Check bias of base drive circuit
OK
N.G
Check IC412, Q405, R444, D414, D415
Check H.out of H-Def
N.G
OK
Check Q413, D401, Q414~Q418, IC408, IC407, R455~ R457, D430
Check Bias of H-Def.
YES
?
NO
Check Q407, D402, D411, IC400
Check Vertical Def.
N.G
OK
Check IC311, Q319
RETURN

Measure Pin #6 of IC402
(refer to waveform #2)

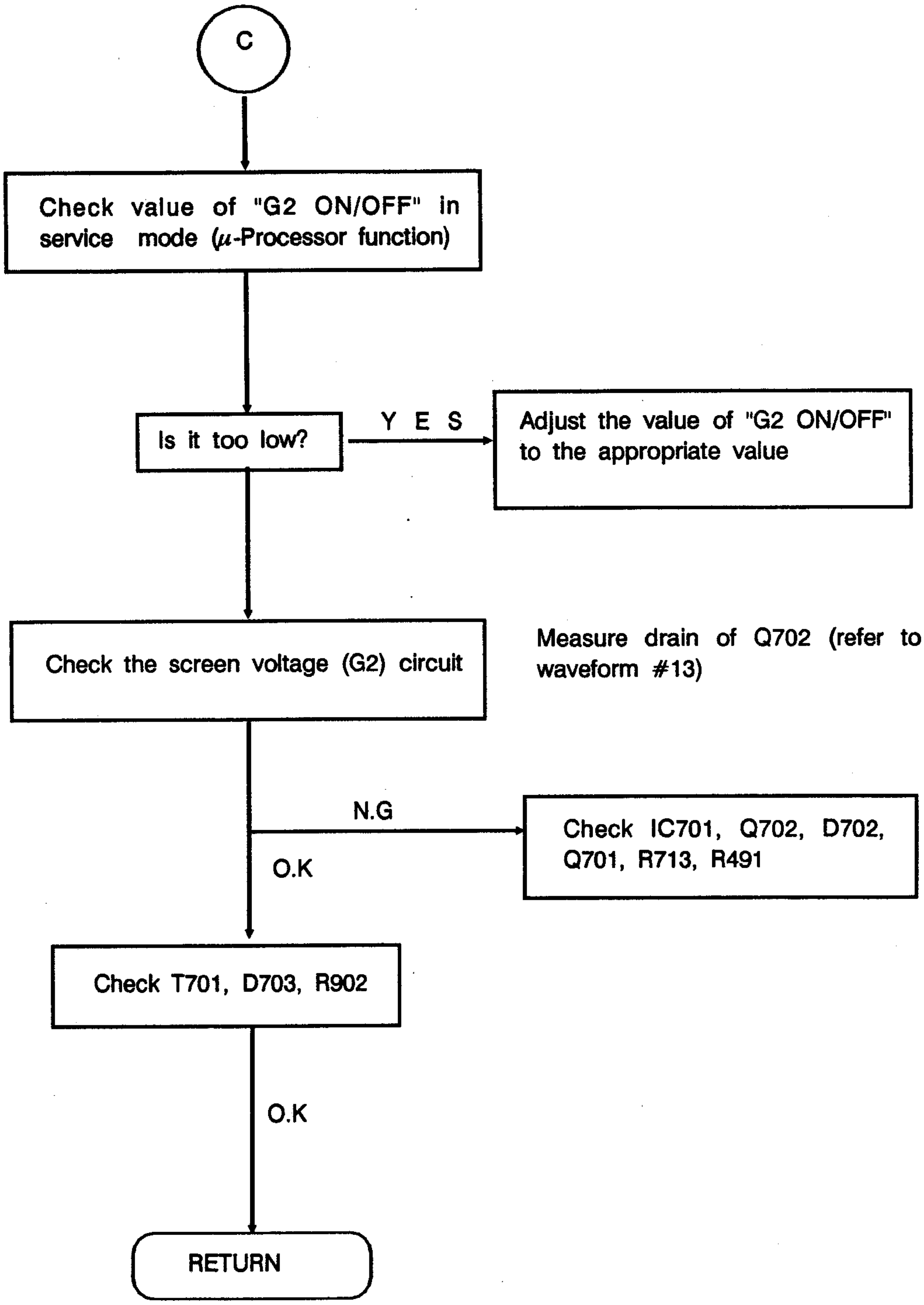
Measure Drain of Q420
(refer to waveform #3)

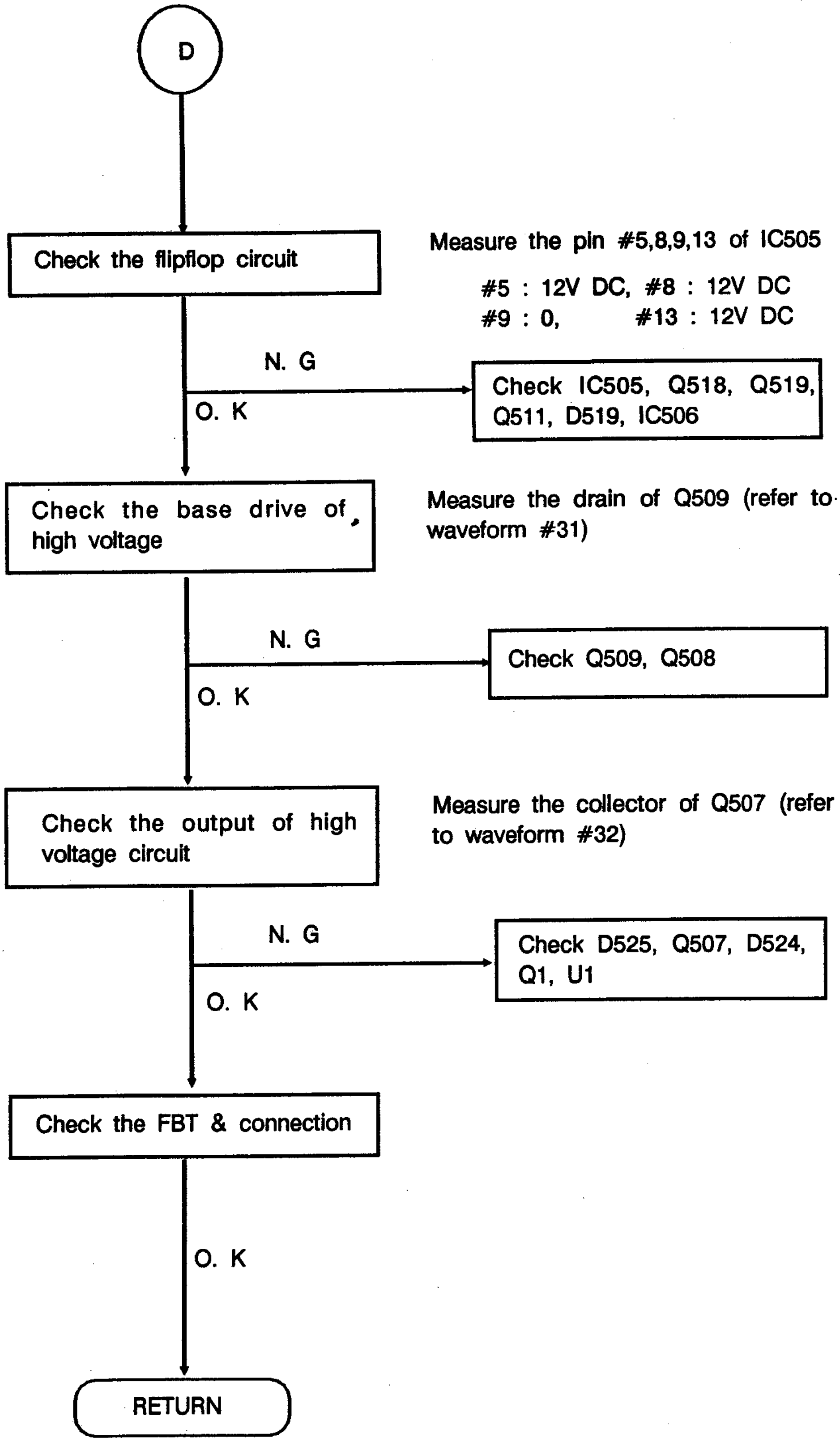
Measure the cathode of D415
(@+17V - 20V DC)

Measure collector of Q413
(refer to waveform #5)

Measure cathode of D402
(refer to waveform #8)

Measure Pin #1 of IC311
(refer to #12)


C
Check value of "G2 ON/OFF" in service mode (μ-Processor function)
Is it too low?
YES
Adjust the value of "G2 ON/OFF" to the appropriate value
Check the screen voltage (G2) circuit
Measure drain of Q702 (refer to waveform #13)
N.G
Check IC701, Q702, D702, Q701, R713, R491
O.K
Check T701, D703, R902
O.K
RETURN


D
Check the flipflop circuit
N. G
O. K
Check IC505, Q518, Q519, Q511, D519, IC506
Check the base drive of high voltage
N. G
O. K
Check Q509, Q508
Check the output of high voltage circuit
N. G
O. K
Check D525, Q507, D524, Q1, U1
Check the FBT & connection
O. K
RETURN

Measure the pin #5,8,9,13 of IC505

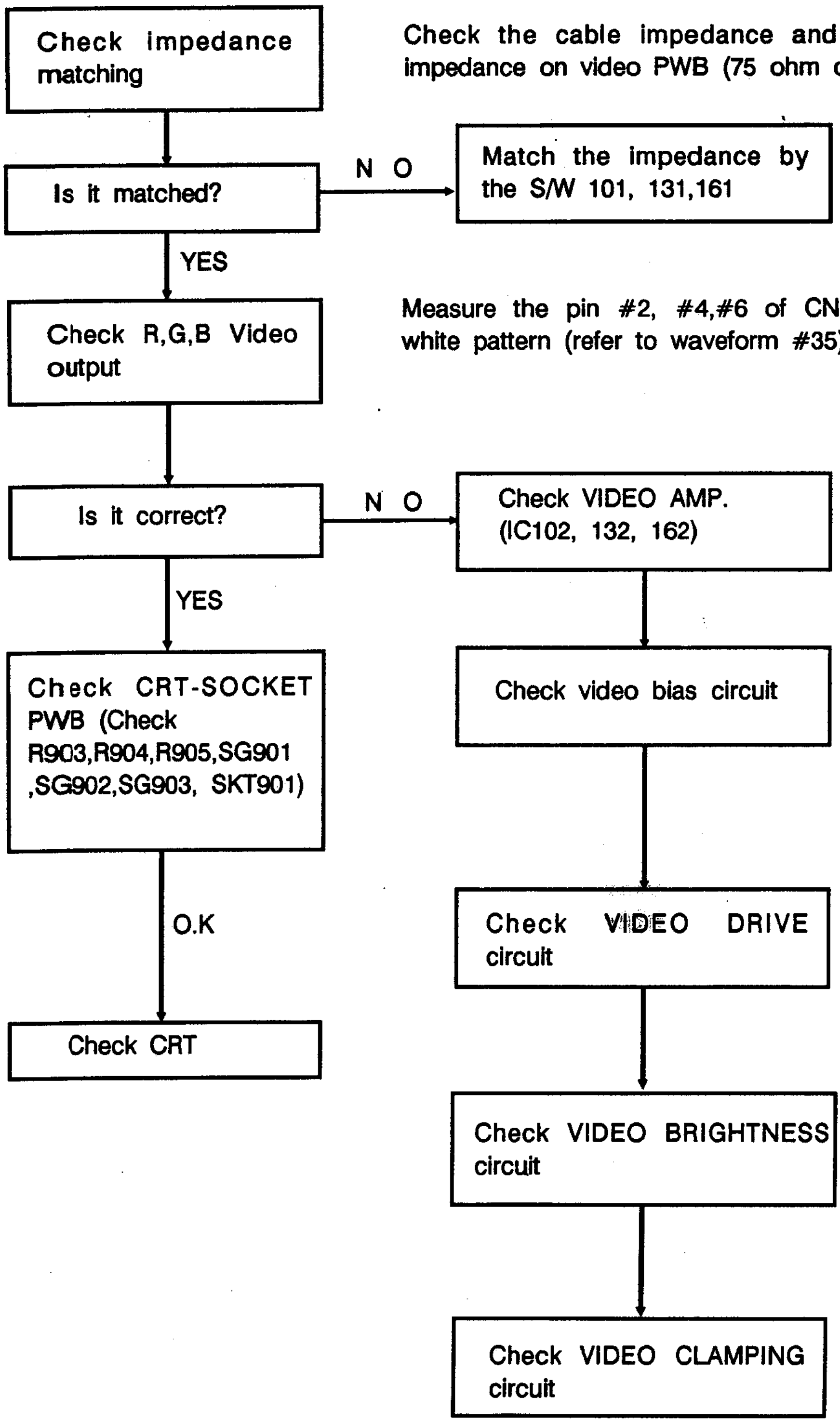
#5 : 12V DC, #8 : 12V DC
#9 : 0, #13 : 12V DC

Measure the drain of Q509 (refer to waveform #31)

Measure the collector of Q507 (refer to waveform #32)

2. ABNORMAL VIDEO ON CRT SCREEN

2-1. TOO BRIGHT, TOO DARK, or BRIGHTNESS, CONTRAST CONTROL ERROR


Check impedance matching
Is it matched?
N O
Match the impedance by the S/W 101, 131,161
YES
Check R,G,B Video output
Is it correct?
N O
Check VIDEO AMP. (IC102, 132, 162)
YES
Check CRT-SOCKET PWB (Check R903,R904,R905,SG901 ,SG902,SG903, SKT901)
O.K
Check CRT
Check video bias circuit
Check VIDEO DRIVE circuit
Check VIDEO BRIGHTNESS circuit
Check VIDEO CLAMPING circuit

Check the cable impedance and signal input impedance on video PWB (75 ohm or high)

Measure the pin #2, #4,#6 of CN102 with full white pattern (refer to waveform #35)

CR 2424
Pin #1 : input
Pin #2,3,7,8 : GND
Pin #4 : +60V DC
Pin #9 : output

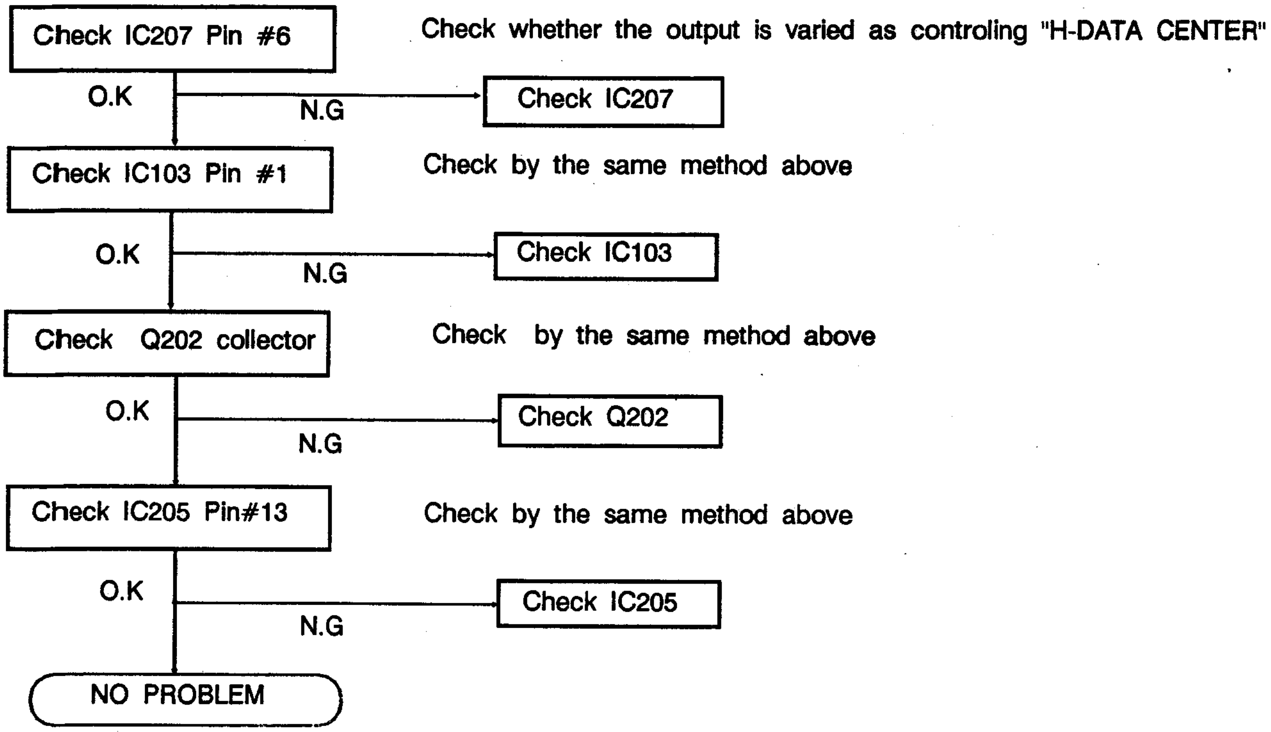
Check 12V,60V,180V Line

Check IC101, IC132, IC161, Q101, Q131, Q161, IC103, IC207 and related circuit

Check D101, D102, D131, D132, D161, D162, Q102, Q132, Q162, IC104, IC207 (#16,17,18) and related circuit

Check Q203, Q204, IC205 and related ciruit

2-2. H-DATA CENTER CONTROL ERROR


Check IC207 Pin #6
O.K
N.G
Check IC207
Check IC103 Pin #1
O.K
N.G
Check IC103
Check Q202 collector
O.K
N.G
Check Q202
Check IC205 Pin#13
O.K
N.G
Check IC205
NO PROBLEM

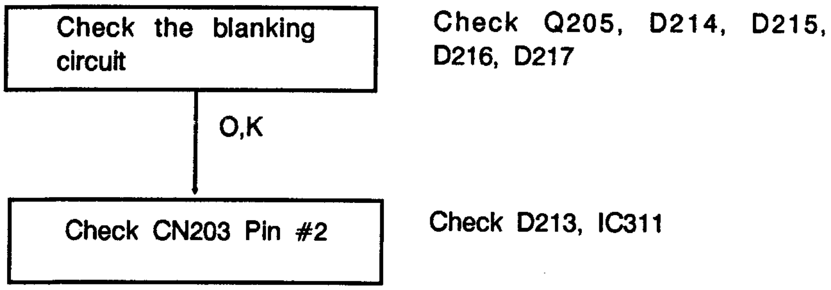
Check whether the output is varied as controling "H-DATA CENTER"

Check by the same method above

Check by the same method above

Check by the same method above

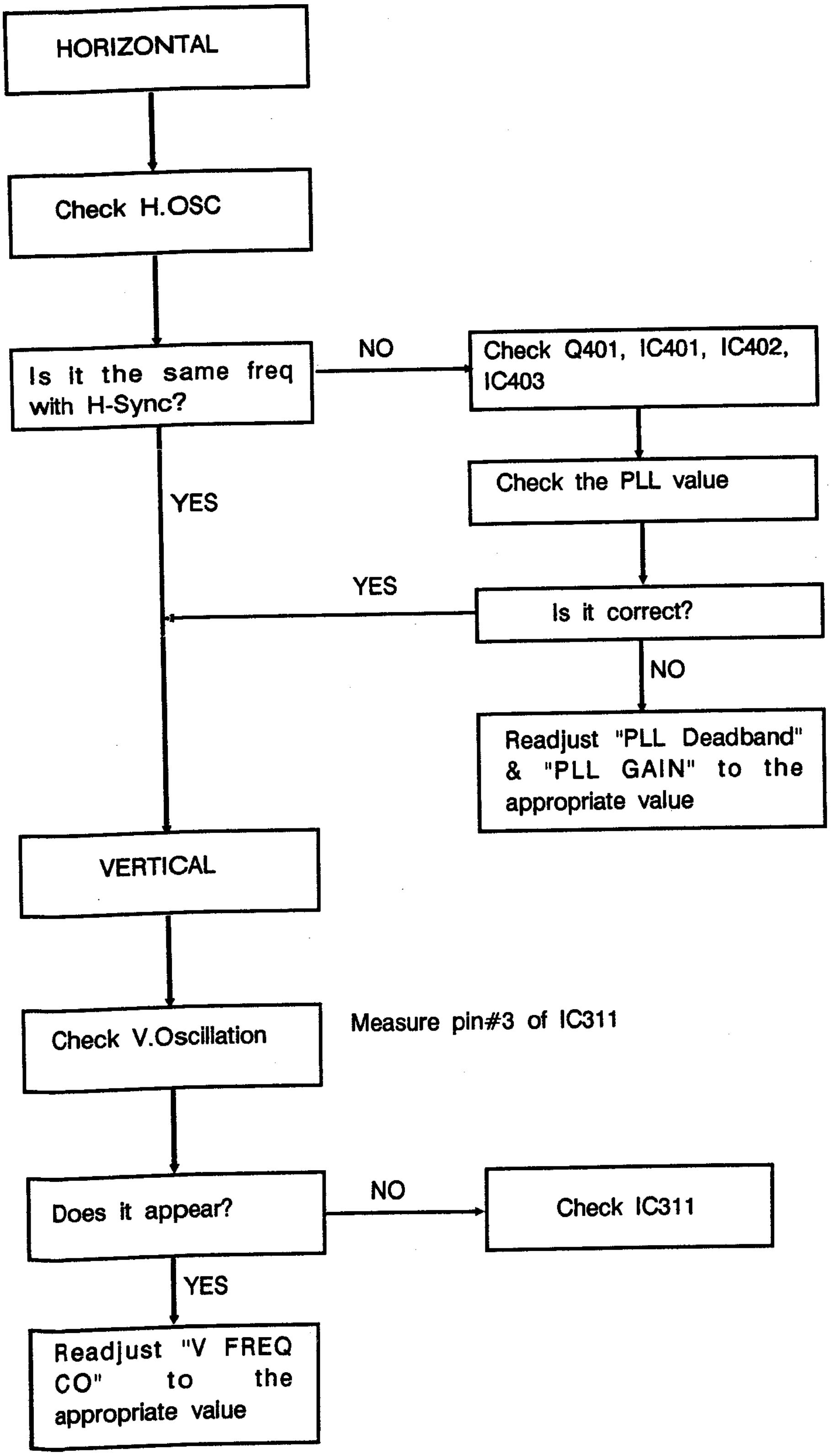
2-3. VISIBLE RETRACE LINE


Check the blanking circuit
O,K
Check CN203 Pin #2

Check Q205, D214, D215, D216, D217

Check D213, IC311

3. UNSTABLE SYNCHRONIZATION

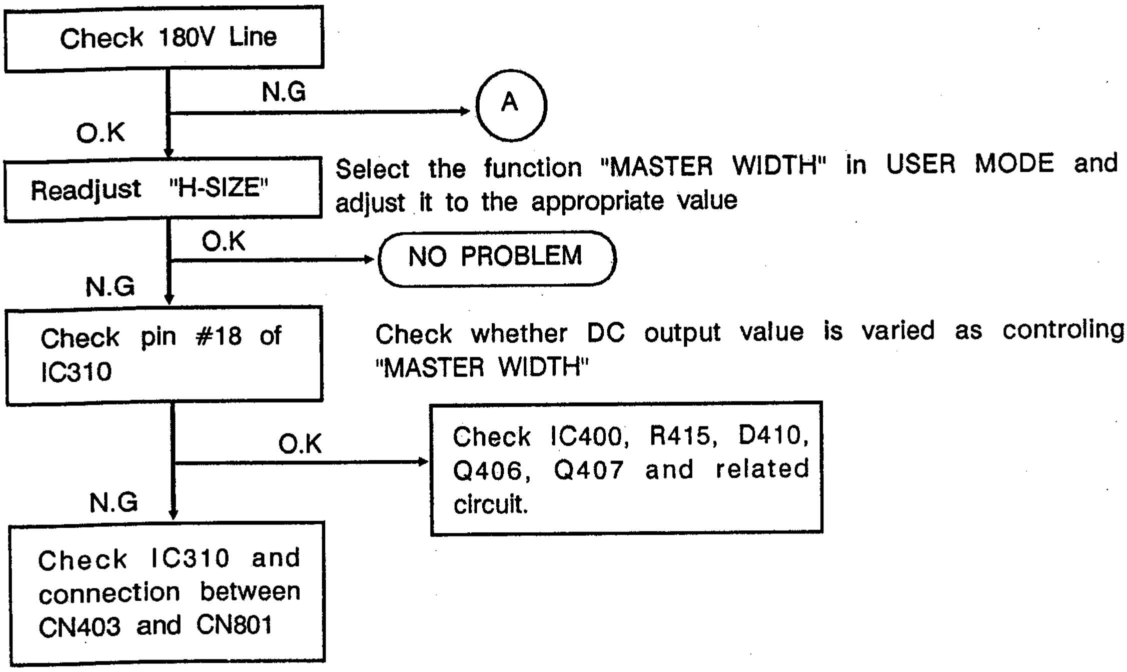

HORIZONTAL
Check H.OSC
Is it the same freq with H-Sync?
NO
Check Q401, IC401, IC402, IC403
Check the PLL value
YES
YES
Is it correct?
NO
Readjust "PLL Deadband" & "PLL GAIN" to the appropriate value
VERTICAL
Check V.Oscillation
Measure pin#3 of IC311
Does it appear?
NO
Check IC311
YES
Readjust "V FREQ CO" to the appropriate value

Measure the Pin #10 of IC309

Freq.	PIN #10
58KHz	5.5 VDC
64	4.9 VDC
75	3.0 VDC
77	2.8 VDC

4. ABNORMAL PICTURE SIZE & SHAPE

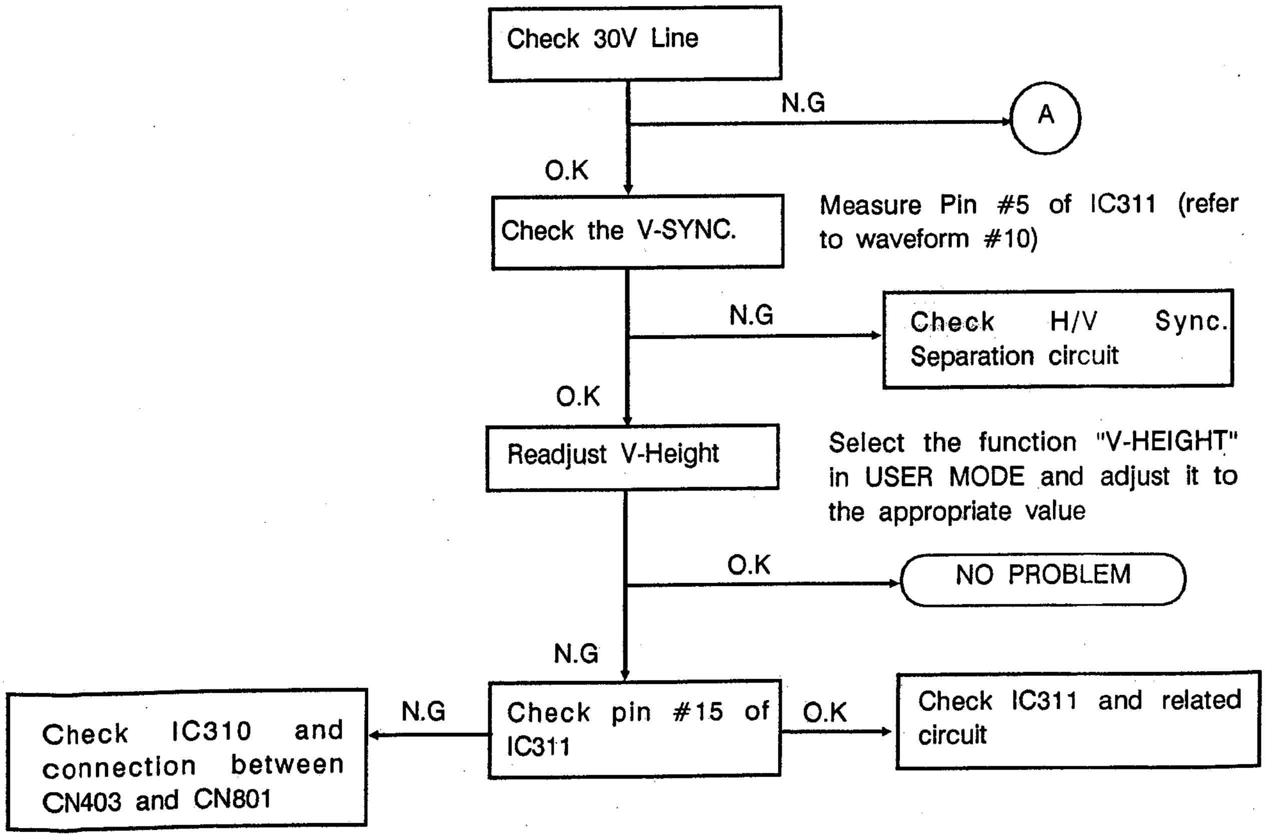
4-1. ABNORMAL HORIZONTAL WIDTH


Check 180V Line
N.G
A
O.K
Readjust "H-SIZE"
O.K
NO PROBLEM
N.G
Check pin #18 of IC310
O.K
Check IC400, R415, D410, Q406, Q407 and related circuit.
N.G
Check IC310 and connection between CN403 and CN801

Select the function "MASTER WIDTH" in USER MODE and adjust it to the appropriate value

Check whether DC output value is varied as controling "MASTER WIDTH"

4-2. ABNORMAL VERTICAL HEIGHT

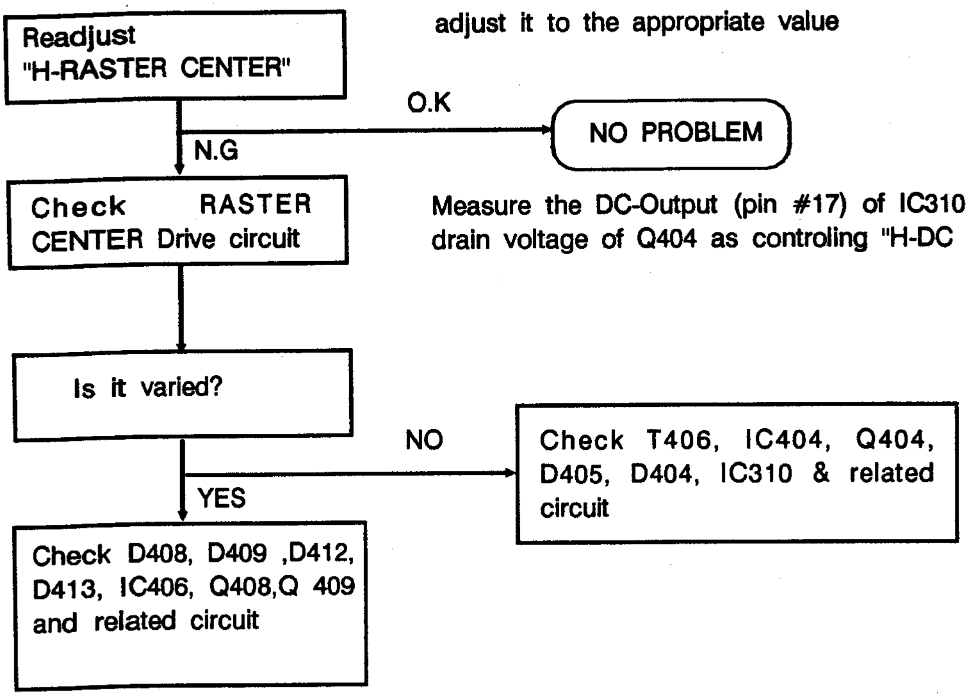

Check 30V Line
N.G
A
O.K
Check the V-SYNC.
N.G
Check H/V Sync. Separation circuit
O.K
Readjust V-Height
O.K
NO PROBLEM
N.G
Check pin #15 of IC311
O.K
Check IC311 and related circuit
N.G
Check IC310 and connection between CN403 and CN801

Measure Pin #5 of IC311 (refer to waveform #10)

Select the function "V-HEIGHT" in USER MODE and adjust it to the appropriate value

4-3. RASTER CENTERING

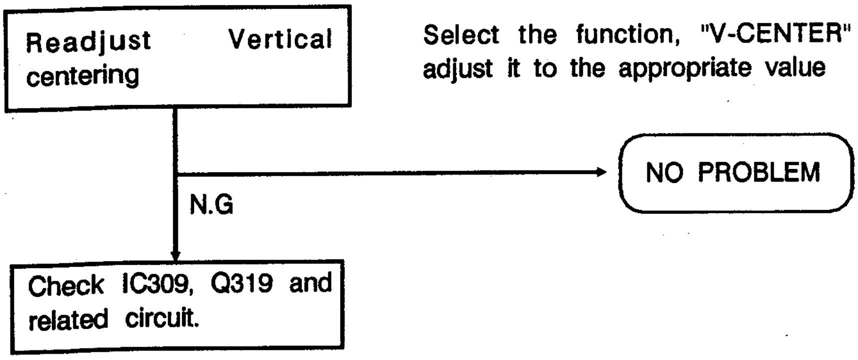
1) HORIZONTAL


Readjust "H-RASTER CENTER"
O.K
NO PROBLEM
N.G
Check RASTER CENTER Drive circuit
Is it varied?
NO
Check T406, IC404, Q404, D405, D404, IC310 & related circuit
YES
Check D408, D409 ,D412, D413, IC406, Q408,Q 409 and related circuit

Select the function "H-DC CENTER" in service mode and adjust it to the appropriate value

Measure the DC-Output (pin #17) of IC310 and peak to peak drain voltage of Q404 as controling "H-DC CENTER"

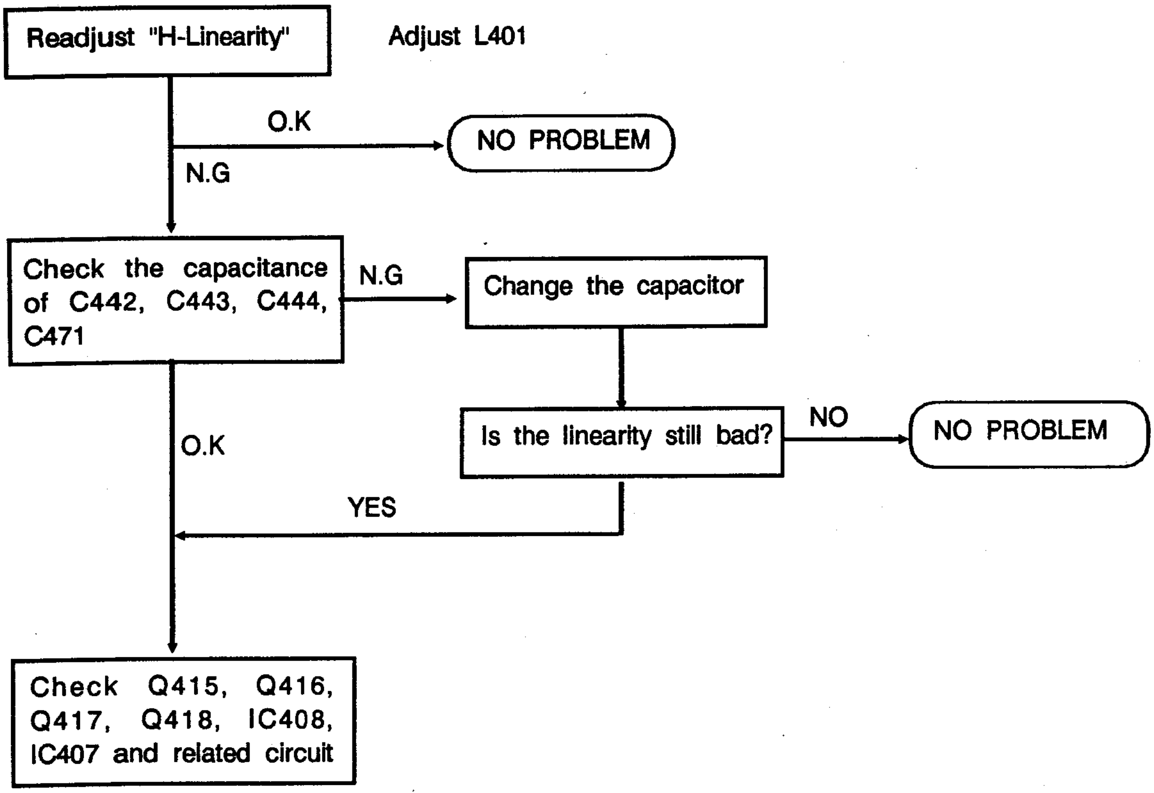
2) VERTICAL


Readjust Vertical centering
NO PROBLEM
N.G
Check IC309, Q319 and related circuit.

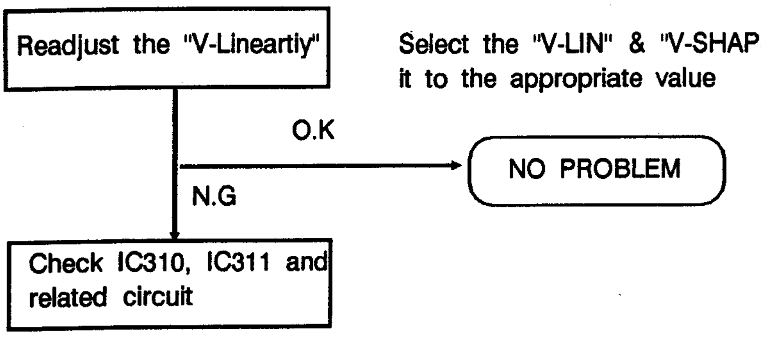
Select the function, "V-CENTER" is USER MODE and adjust it to the appropriate value

4-4. LINEARITY

1) HORIZONTAL

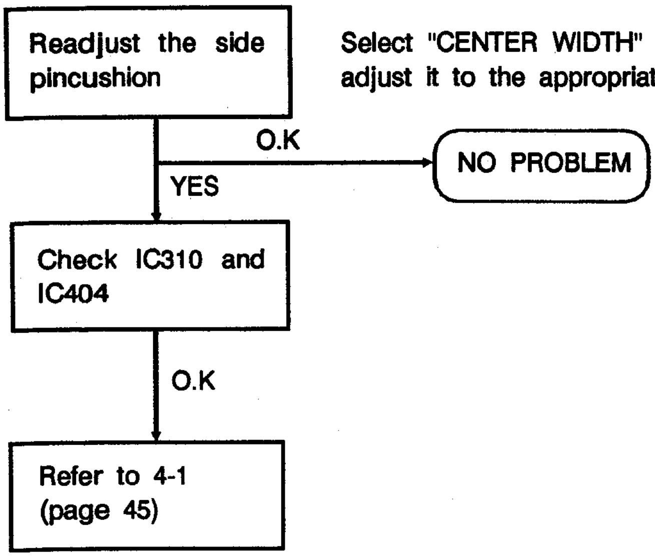

Readjust "H-Linearity"
Adjust L401
O.K
NO PROBLEM
N.G
Check the capacitance of C442, C443, C444, C471
N.G
Change the capacitor
O.K
Is the linearity still bad?
NO
NO PROBLEM
YES
Check Q415, Q416, Q417, Q418, IC408, IC407 and related circuit

2) VERTICAL


Readjust the "V-Lineartiy"
O.K
NO PROBLEM
N.G
Check IC310, IC311 and related circuit

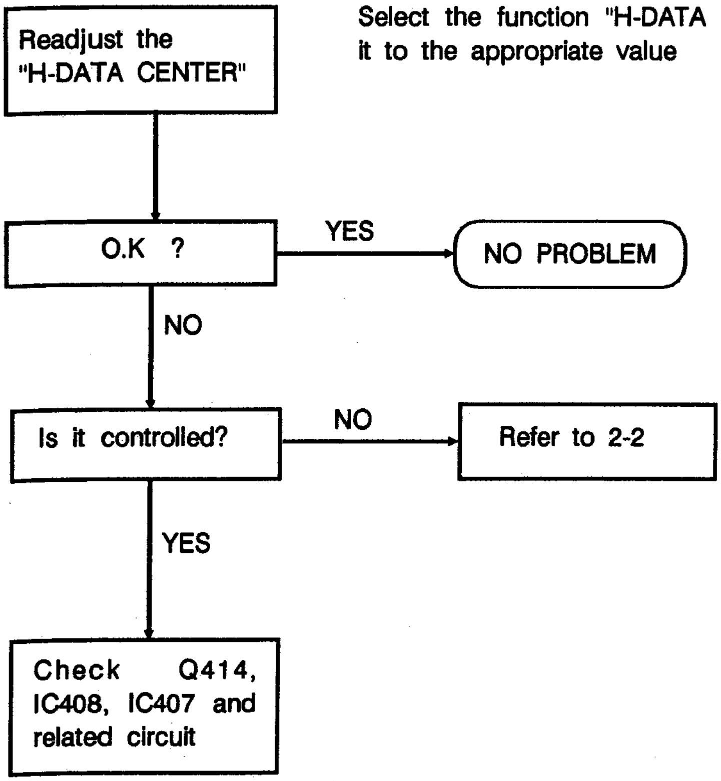
Select the "V-LIN" & "V-SHAPE" in user mode and adjust it to the appropriate value

4-5. SIDE PINCUSHION


Readjust the side pincushion
O.K
NO PROBLEM
YES
Check IC310 and IC404
O.K
Refer to 4-1 (page 45)

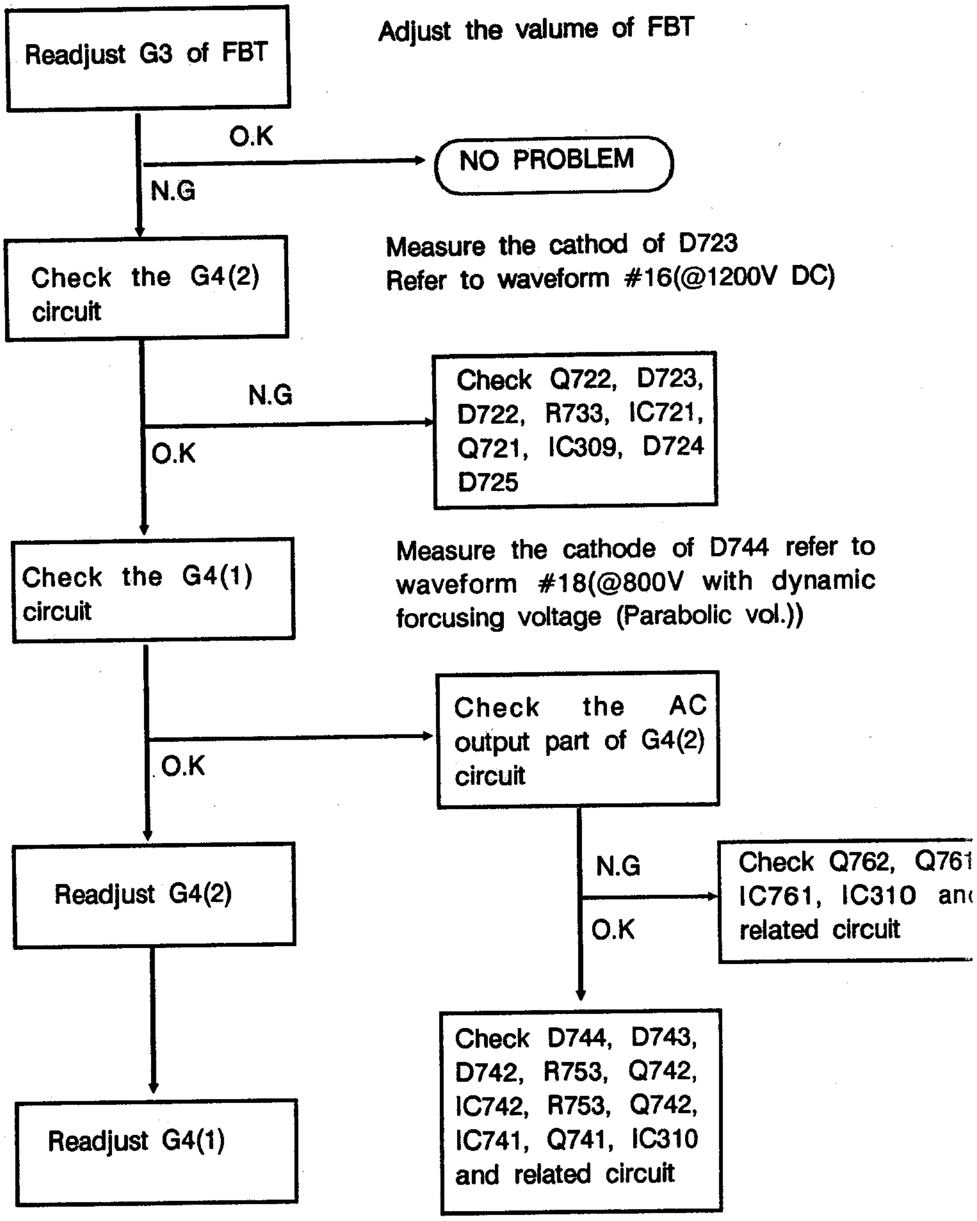
Select "CENTER WIDTH" and "BOTTOM WIDTH" in user mode, adjust it to the appropriate value

4-6. OVERLAP PICTURE


Readjust the "H-DATA CENTER"
O.K ?
YES
NO PROBLEM
NO
Is it controlled?
NO
Refer to 2-2
YES
Check Q414, IC408, IC407 and related circuit

Select the function "H-DATA CENTER" in user mode, adjust it to the appropriate value

5. POOR FOCUS


Readjust G3 of FBT
O.K
NO PROBLEM
N.G
Check the G4(2) circuit
N.G
Check Q722, D723, D722, R733, IC721, Q721, IC309, D724 D725
O.K
Check the G4(1) circuit
Check the AC output part of G4(2) circuit
O.K
N.G
Check Q762, Q761 IC761, IC310 an related circuit
O.K
Readjust G4(2)
Check D744, D743, D742, R753, Q742, IC742, R753, Q742, IC741, Q741, IC310 and related circuit
Readjust G4(1)

Adjust the valume of FBT

Measure the cathod of D723
Refer to waveform #16(@1200V DC)

Measure the cathode of D744 refer to waveform #18(@800V with dynamic forcusing voltage (Parabolic vol.))

Select the function "G4 OFF/ADJUST" in service mode.

Adjust "CENTER FOCUS" first and then "TOP FOCUS" and finally "SIDE FOCUS"

ELECTRICAL PART LIST

PRODUCT SAFETY NOTE : Components marked with a "!" have special characteristic important to safety. Before replacing any of these components,read carefully the SAFETY NOTES on page 4 of this service manual. Do not degrade the safety of the product through improper servicing. Components marked with an "#" are related to the X-ray protection circuit.

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
ASS'Y POWER PCB			
	0C906-000-2120	ASS'Y-H/S POWER MJH16206:CD-2167SC	
	0C907-000-0630	ASS'Y-H/S IRF 740 POWER:CD-2167SC	
C1,C2,C612	01400-757-331	C-MONO MULTI:SR211A331JAATR(AVX)	
C3,C4	01400-757-104	C-MONO MULTI:SR211C104JAATR(AVX)	
C5	01400-757-222	C-MONO MULTI:SR211A 222J AA TR CAVX	
C539	01517-383-473	C-M,POLYESTER:CF922M 250V 0.47M-J	
C540,C548,C553,C554, C559,C608	01607-906-470	C-ELEC.105'C:CE4W 50V 47UF 105'C RA/KM	
C541,C609,C610,C616	01417-344-104	C-CERAMIC,HK:CK45(T) F50V 0.1M-Z	
C542	01505-723-222	C-POLYESTER:CQ921M(T) 100V 0.0022-J	
C543	01502-583-102	C-POLYPROPYLENE:CQ922M 2KV 0.001M-J	!
C544,C560,C617,C618, C619,C620,C621,C622	01517-383-104	C-M,POLYESTER:CF922M 250V 0.1M-J	
C545	01517-323-109	C-M,POLYESTER:CF922M 100V 1.0M-J	
C546	01502-512-222	C-POLYPROPYLENE:CQ922M 100V 2200PF-J	
C547	917 742100QM	CAP-AL.ELE,106M,2E,10X20,105C:(T)10UF	
C549	01417-318-471	C-CERAMIC HK:CK45(T) B 50V 470-K	
C550	01400-757-104	C-MONO MULTI:SR211C104JAATR(AVX)	#
C551	01417-344-104	C-CERAMIC,HK:CK45(T) F50V 0.1M-Z	#
C552	01505-723-222	C-POLYESTER:CQ921M(T) 100V 0.0022-J	#
C555,C557	915 266100HZAH	CAP-CERAMIC,104Z,1H:100NF,50V,+80-20%,Z	
C556,C558	01417-318-101	C-CERAMIC,HK:CK45(T) B 50V 100-K	
C601,C602	01535-828-474	C-M,PAPER:PME271M 647(0.47UF)	!, FTZ
C601,C603	01035-829-104	C-M,PAPER:PME271M 610(0.1UF)	!
C602	01035-828-474	C-M,PAPER:PME271M 647(0.47UF)	!
C603	01566-513-224	C-M,POLYESTER,AC:CQS 922M 250V 0.22M-M	!, FTZ
C604,C605	01535-829-472	C-M,PAPER:PME271Y 447(0.0047UF)	!
C606,C607	01607-910-471	C-ELEC, 105'C HA:CE04W 250V 470M	
C611,C614	01400-157-104	C-MONO MULTI:SR215C104JAATR(AVX)	
C613,C638	01400-757-471	C-MONO MULTI:SR211A471JAATR(AVX)	
C623,C628	01607-906-471	C-ELECTROLYTIC:CE04W 50V 470M 105'C RA	
C624,C625,C645,C646	917 813100FM	CAP-AL,ELE,107M,1V,8X11.5,105C:(T)100UF	
C626	01607-906-471	C-ELECTROLYTIC:CE04W 50V 470M 105'C RA	
C627	01607-905-101	C-ELEC:CE04W 35V 100UF 105'C RA/KM	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
C629,C630,C631,C632, C633,C634	01607-908-331	C-ELEC.105'C:CE04W 100V 330UF 105'C RA	
C635	01419-901-220	C-CERAMIC,HK:CK45 B 1KV 220-K	
C636	01417-318-222	C-CERAMIC,HK:CK45(T) B 50V 2200-K	
C637	01416-468-332	C-CERAMIC,HK:CK45 B 500V 3300-K	
C639,C615	01400-757-102	C-MONO MULTI:SR211A102JAATR(AVX)	
C641,C642,C643,C644	01416-649-472	C-CERAMIC,HK:DE7150F 472M VA-1-KC	!
C7	01507-543-102	C-POLYPROPYLENE:CQ922M 400V 0.001/M-J	
CN205+	955 460160AAAA	CBF-CONN ASSY,100MM,7P:7P POWER	
CN401+	955 460159AAAA	CBF-CONN ASSY,300MM,11P:11P POWER	
CN501	03344-112-080	CONNECTOR-WAFER:5273-09A	
CN503	03344-163-902	CONNECTOR-STRAIGHT HEADER:2521P02V000	
CN601,CN602	03344-151-270	CONNECTOR-WAFER:5274-07A	
CN603	03344-159-030	CONNECTOR-WAFER:5096-04C MOLEX	
CN605	03344-112-040	CONNECTOR-WAFER:5273-05A(MOLEX)	
CN606	03344-151-211	CONNECTOR-WAFER:5274-11A MOLEX	
D1,D517,D518,D521, D522,D523,D526,D527, D607	02169-301-417	DIODE:1N4148(T)	
D514,D515,D516	02169-201-057	DIODE:1N4001F	
D519	02169-218-087	DIODE:UF4002(T)	#
D520	02169-301-417	DIODE:1N4148(T)	#
D604,D611,D612	02169-218-087	DIODE:UF4002(T)	
D524,D609,D610,D613	02169-304-350	DIODE:UF 5404 (GI)	
D525	02169-301-070	DIODE:MUR4100	
D528	02169-401-590	DIODE-ZENER:BZX 79C 5V1	
D601,D602,D605,D606	02169-101-490	DIODE:1N4937	
D603	02169-210-620	DIODE-BRIDGE:KBPC106	
D608	02169-304-360	DIODE:UF 5402 (GI)	
IC505	02109-307-120	IC-COMS:MC14011B	#
IC506	02109-309-410	IC-I/O EXPANDOR:PC F8574/A	#
IC507	02119-601-130	IC-LINEAR:MC7812CT	
IC601	02119-501-410	IC-DRIVER:IR2110	
IC602	02119-602-140	IC-PWM CONTROL:UC3844	
IC603	02119-901-280	OPTO-COUPLER:CNY17-2	
IC604	02119-901-410	OPTO-COUPLER:MOC3021	
L601,L602,L603	02429-059-310	COIL-CHOKE:30UH	
NTH601,NTH602	02189-601-370	THERMISTOR-N:NTH5013	
PTH601	02189-605-470	POSISTOR:PTH451C40BG200N270	
PTH602	02189-605-040	POSISTOR:PTH451C06BG080N140	
Q1	02149-601-441	FET-IRF 740 LSS(T):	
Q2	02139-104-220	TRANSISTOR:MPS2222A	
Q3,Q508	02139-104-290	TRANSISTOR:PN2907	
Q3,Q508	02139-104-290	TRANSISTOR:PN2907	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
Q507	02159-301-750	TRANSISTOR:MJH16206	
Q509	02149-601-820	FET:VN2222LL	
Q510	02139-104-220	TRANSISTOR:MPS2222A	#
Q511	02119-601-420	IC-SHUNT REGULATOR:TL431C	#
Q518,Q519	02139-201-197	TRANSISTOR:KSR1001(T)	#
Q601,Q602	02179-002-020	TRIAC:MAC210A6	
Q603,Q604	02149-601-441	FET-IRF 740 LSS(T):	
Q605	02119-601-420	IC-SHUNT REGULATOR:TL431C	
Q606	02139-201-197	TRANSISTOR:KSR1001(T)	
R1,R4,R5	911 145107YA	REF-CF,5.1K,5%,1/6W:150V,-1300 TO +350P	
R2	01018-377-229	R-CARBON:RD 1/2T 2.2-J	
R3,R622	01018-277-102	R-CARBON:RD 1/4T 1K-J	
R526,R527	01018-277-221	R-CARBON:RD 1/4T 220-J	
R526,R542,R543	01018-277-101	R-CARBON:RD 1/4T 100-J	
R528	01018-277-473	R-CARBON:RD 1/4T 47K-J	#
R529,R534	01018-277-222	R-CARBON:RD 1/4T 2.2K-J	#
R530,R617	01018-277-222	R-CARBON:RD 1/4T 2.2K-J	
R531,R532	01018-277-472	R-CARBON:RD 1/4T 4.7K-J	#
R533,R545,R546,R547, R548,R621,R624	01018-277-472	R-CARBON:RD 1/4T 4.7K-J	
R535	01016-377-229	R-CARBON:RD 1/2T 2.2-J(S)	
R536,R613	01018-277-100	R-CARBON:RD 1/4T 10-J	
R537	01018-277-563	R-CARBON:RD 1/4T 56K-J	
R540	01018-277-682	R-CARBON:RD 1/4T 6.8K-J	
R541	01045-577-471	R-METAL OXIDE:RS 2T 470-J	
R544	01016-377-102	R-CARBON:RD 1/2T 1K-J(S)	
R551,R552	01018-277-333	R-CARBON:RD 1/4T 33K-J	
R553,R601,R602	01018-377-221	R-CARBON:RD 1/2T 220-J	
R6	911 111007FK	REF-CF,1,5%,1/2W,F.P:350V,-1300 TO +350	
R603	01018-377-101	R-CARBON:RD 1/2T 100-J	
R604	01028-378-334	R-COMPOSITION:ERC12GK334V(RC 1/2T 330K	
R605,R606	01085-527-104	R-METAL,OXIDE:RS 2P 100K-J(S)	
R607	911 602207JU	REF-WW,0.22,5%,2W:-,-250 TO +250PPM/C	
R608	01018-277-912	R-CARBON:RD 1/4T 9.1K-J	
R609,R610	01016-377-689	R-CARBON:RD 1/2T 6.8-J(S)	
R610	01018-277-229	R-CARBON:RD 1/4T 2.2-J	
R611,R612	01018-277-473	R-CARBON:RD 1/4T 47K-J	
R614	911 643307SU	REF-WW,3.3K,5%,10W:-,-260 TO +260PPM/C	
R615,R616,R619	01018-377-153	R-CARBON:RD 1/2T 15K-J	
R618	01018-277-512	R-CARBON:RD 1/4T 5.1K-J	
R620	01018-277-513	R-CARBON:RD 1/4T 51K-J	
R623	01048-275-202	R-METAL,FILM,RM 1/4T 2K-F:	
R625	01016-377-100	R-CARBON:RD 1/2T 10-J(S)	
R627,R628	01058-327-056	R-FUSIBLE:FMR 1/2P 0.56-J	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
R7,R538,R539	01018-377-224	R-CARBON:RD 1/2T 220K-J	
R8	911 146807YA	REF-CF,6.8K,5%,1/6W:150V,-1300 TO +350P	
T505	02899-004-810	TRANS-H/V FEEDBACK:EE4035	!,#
T506	02849-033-710	TRANS-H/V DRIVE:EI22/19	!
T510	02899-004-910	TRANS-H/V REGULATE:EE30/26	!
T601,T602	02429-647-910	COIL-LINE FILTER:UF3438S, 100X100 TN	!
T603	02879-007-110	TRANS-SMPS:PQ5050,H7C1-12P (CD-2167SC)	!
T604	02899-004-510	TRANS-CHOKE:30UH*4	!
U1	881 300043AA	IC-LIN,DLAB43A,REGULATOR:DIP,8,-,5V	
VAR601,VAR602	02189-102-010	VARISTOR:V150-LA10A	
VR502	01241-108-004	VR-SEMI:CET 92A B50K	
VR601	01241-108-002	VR-SEMI:CET 92A B500	
ASS'Y VIDEO PCB			
	05683-706-210	HEATSINK-TR:A6063 EXTR.BLK	
	05683-709-230	HEAT-SINK, TR:AL A1050S T1.0 CVB458*	
	05683-709-510	HEATSINK-CR2424:ALUMINUM CD-2167SC	
	06612-711-810	BRKT-BNC:BSS3 T1.0	
	0C906-000-2200	ASS'Y-BNC VIDEO:CD-2167SC	
	0C907-000-0610	ASS'Y-H/S REGU 7805 VIDEO:CD-2167SC	
	0C907-000-0620	ASS'Y-H/S REGU 7812 VIDEO:CD-2167SC	
	0C907-000-0690	ASS'Y-H/S 3595 VIDEO:CD-2167SC	
C101,C107,C131,C137, C161,C167	01628-345-106	C-TANTAL:TAP106K016 CRW(10M/16V)	
C102,C132,C162	01400-757-103	C-MONO MULTI:SR211C103JAATR(AVX)	
C103,C104,C111,C118, C119,C120,C133,C134, C135,C141,C149,C150, C163,C165,C164,C171, C180,C202,C203,C208, C209,C212,C217,C220, C203	915 266100HZAH	CAP-CERAMIC,104Z,1H:100NF,50V,+80-20%,Z	
C106,C108,C112,C114, C136,C138,C142,C144, C166,C168,C172,C174, C205,C214,C216,C218, C223	01400-757-104	C-MONO MULTI:SR211C104JAATR(AVX)	
C109,C139,C169	01400-757-180	C-MONO MULTI:SR211A180JAATR(AVX)	
C110,C140,C170	01829-106-110	C-TRIMMER:ECR-LA030E12	
C113,C143,C173	01607-908-470	C-ELECTROLYTIC:CE04W 100V 47M 105'C RA	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
C115,C122,C145,C152, C175,C182,C221	01509-125-590	C-POLYESTER:CQ921M 200V 0.1M-K	
C116,C146,C176	01607-911-229	C-ELECTROLYTIC:105'C CE04W 350V 2.2UF	
C117,C147,C177	01417-318-102	C-CERAMIC HK:CK45(T) B 50V 1000-K	
C121,C151,C181,C225	01400-157-104	C-MONO MULTI:SR215C104JAATR(AVX)	
C201,C204,C207,C210	01607-905-220	C-ELECTROLYTIC:CE04W(T) 35V 22M(105'C)	
C206	01519-002-310	C-M POLYESTER:CF922M 250V 0.1M-K	
C211,C213	01628-375-475	C-TANTAL:TAP475K035CRW(4.7M/35V)	
C215,C241,C219	01400-757-102	C-MONO MULTI:SR211A102JAATR(AVX)	
C226,C231	01400-757-471	C-MONO MULTI:SR211A471JAATR(AVX)	
C227,C228,C229	01407-048-101	C-CERAMIC TEMP:CC45(T) RH 50V 100-K	
C232	01608-904-470	C-ELECTROLYTIC:CE04W(T) 25V 47M	
C240	01603-910-479	C-ELECTROLYTIC:CE04W 250V 4.7U	
CN101,CN131,CN161, CN201,CN202	03399-100-110	JACK-BNC:227754-1 (AMP)	
CN102,CN205	03344-112-060	CONNECTOR-WAFER:5273-07A MOLEX	
CN203	03349-061-100	CONNECT-WAFER:5046-10A MOLEX	
CN204	03344-112-020	CONNECTOR-WAFER:5273-03A	
CN402+	955 460158AAAA	CBF-CONN ASSY,100MM,10P:10P VIDEO	
D101,D102,D103,D104, D131,D132,D133,D134, D161,D162,D163,D164, D201,D202,D203,D204, D205,D206,D207,D208, D209,D210,D211,D212, D213,D214,D215,D216	02169-301-417	DIODE:1N4148(T)	
D215	02169-402-047	DIODE-ZENER:1N975BRL(T)	
D217	02169-201-077	DIODE:1N4003(T)	
D218	02169-404-797	DIODE-ZENER:UZ-16BM(T)	
IC101,IC131,IC161	02119-103-110	IC:LM1201	
IC102,IC132,IC162	02119-101-850	IC-VIDEO:CR2424	
IC103,IC104	02119-202-010	IC-LINEAR:LM324(SST)	
IC201	02119-601-700	IC-REGULATOR: MC7812C,SST	
IC202	02119-602-010	IC-REGULATOR:MC7805(SST)	
IC203	02119-602-100	IC-REGULATOR:MC7905(SST)	
IC204	02109-104-260	IC:74HC86	
IC205	02109-305-780	IC:74HC221P	
IC207	02109-301-610	IC-D/A CONVERTER:DAC-8800	
JUMP1,JUMP2,JUMP3	01417-344-104	C-CERAMIC,HK:CK45(T) F50V 0.1M-Z	
L101,L131,L161	02429-048-017	FERRITE-CORE:1.5MH+-20% (T)	
L201	02429-059-310	COIL-CHOKE:30UH	
LUG1,LUG2,LUG3,LUG4	03054-223-730	LUG-TERMINAL,ASSY:AWG#18 BLK L-150	
Q101,Q131,Q161	02139-302-350	TRANSISTOR:2SC3595	
Q102,Q132,Q162	02139-204-037	TRANSISTOR:MPSA 42 (T)	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
Q201	02159-101-130	TRANSISTOR:MPS4258	
Q202	02139-104-290	TRANSISTOR:PN2907	
Q203,Q205	02149-601-820	FET:VN2222LL	
Q204	02139-104-220	TRANSISTOR:MPS2222A	
R101,R131,R161	01016-377-750	R-CARBON:RD 1/2T 75OHM-J(S)	
R102,R132,R162	01018-277-104	R-CARBON:RD 1/4T 100K-J	
R103,R121,R122,R123, R125,R133,R151,R152, R163,R181,R182,R208, R210,R215	01018-277-103	R-CARBON:RD 1/4T 10K-J	
R104,R134,R164	01018-277-479	R-CARBON:RD 1/4T 4.7-J	
R105,R135,R165,R201, R203,R217	01018-277-102	R-CARBON:RD 1/4T 1K-J	
R106,R136,R166,R211, R222	01018-277-222	R-CARBON:RD 1/4T 2.2K-J	
R107,R111,R137,R141, R167,R171	01018-277-512	R-CARBON:RD 1/4T 5.1K-J	
R108,R114,R138,R144, R168,R174	01018-277-821	R-CARBON:RD 1/4T 820-J	
R109,R139,R169	01018-277-680	R-CARBON:RD 1/4T 68-J	
R110,R140,R170	01018-277-682	R-CARBON:RD 1/4T 6.8K-J	
R112,R142,R212	01085-577-161	R-METAL, OXIDE:RS 2T 160J(S)	
R113,R143,R173	01018-277-331	R-CARBON:RD 1/4T 330-J	
R115,R145,R175	01018-277-391	R-CARBON:RD 1/4T 390-J	
R116,R117,R146,R147, R176,R177	01018-277-223	R-CARBON:RD 1/4T 22K-J	
R118,R119,R148,R149, R178,R179	01018-277-224	R-CARBON:RD 1/4T 220K-J	
R120,R150,R180,R230	01018-277-475	R-CARBON:RD 1/4T 4.7M-J	
R124,R154,R184,R216	01018-277-684	R-CARBON:RD 1/4T 680K-J	
R126,R156,R185	01018-277-244	R-CARBON:RD 1/4T 240K-J	
R127,R157,R187,R223	01018-277-221	R-CARBON:RD 1/4T 220-J	
R202	01018-277-474	R-CARBON:RD 1/4T 470K-J	
R204	01018-277-182	R-CARBON:RD 1/4T 1.8K-J	
R205,R206,R218	01018-277-101	R-CARBON:RD 1/4T 100-J	
R207,R209	01018-277-105	R-CARBON:RD 1/4T 1M-J	
R212	01085-677-132	R-METAL, OXIDE:RS 3T 1.3K-J(S)	
R214	01018-277-124	R-CARBON:RD 1/4T 120K-J	
R219,R220	01018-277-101	R-CARBON:RD 1/4T 100-J	
R224	01018-277-470	R-CARBON:RD 1/4T 47-J	
R231	01018-277-332	R-CARBON:RD 1/4T 3.3K-J	
R232	01016-377-221	R-CARBON:RD 1/2T 220-J(S)	
R234,R235	01085-627-569	R-METAL, OXIDE:RS 3P 5.6-J(S)	
SW101,SW131,SW161	03519-108-110	SWITCH-SLIDE:SSSJ212K	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
ASS'Y MAIN PCB			
	0C907-000-0670	ASS'Y-H/S LM317 MAIN:CD-2167SC	
	0C907-000-0640	ASS'Y-H/S IRF 610 MAIN:CD-2167SC	
	0C907-000-0650	ASS'Y-H/S TIP29C MAIN:CD-2167SC	
	0C907-000-0660	ASS'Y-H/S TIP30C MAIN:CD-2167SC	
	831 161010AC	COM,SPACER-SUPPORT:DACN-6N	
	0C906-000-2150	ASS'Y-H/S MAIN MJH16206:CD-2167SC	
C301,C365,C416,C456, C457,C458,C704,C724, C744,C765,C749	915 266100HZAH	CAP-CERAMIC,104Z,1H:100NF,50V,+80-20%,Z	
C361	01509-121-300	C-POLYESTER:CQ921M 100V 0.22M-J	
C362,C363	01502-523-104	C-P0LYPROPYLENE:CQ922M 100V 0.1M-J	
C364,C402,C405,C408, C409,C424,C425,C426, C430,C451,C470,C472, C477,C478,C767,C768, C772	01400-157-104	C-MONO MULTI:SR215C104JAATR(AVX)	
C366,C419,C459,C490, C771	917 742100QM	CAP-AL.ELE,106M,2E,10X20,105C:(T)10UF	
C367,C434,C435	01607-906-470	C-ELEC.105'C:CE4W 50V 47UF 105'C RA/KM	
C368	01607-905-222	C-ELECTROLYTIC:35V 2200UF 105C RG(16*31	
C369	01609-306-681	C-ELECTROLYTIC:CE04W 50V 1000U (16X25)	
C370	01609-402-250	C-ELECTROLYTIC:CE04W 50V 10M	
C371,C410,C427,C452, C764,C769	01400-157-103	C-MONO MULTI:SR215C103JAATR(AVX)	
C400,C707,C727	01505-723-472	C-POLYESTER:CQ921M(T) 100V 0.0047-J	
C401	01400-758-223	C-MONO MULLTI:SR301A 223K AATR	
C403	01608-906-109	C-ELECTROLYTIC:CE04W(T) 50V 1M	
C404	01400-157-152	C-MONO,MULTI:SR215A 152JAA TR	
C406	01628-345-476	C-TANTAL:CS03 16V 47UF K	
C407,C415,C453,C454	01400-757-221	C-MONO MULTI:SR211A221JAATR(AVX)	
C411	01505-723-473	C-POLYESTER:CQ921M(T) 100V 0.047-J	
C412,C414,C445,C766, C770	01400-757-102	C-MONO MULTI:SR211A102JAATR(AVX)	
C413,C418,C429,C705, C706,C725,C726,C745, C746	01400-757-471	C-MONO MULTI:SR211A471JAATR(AVX)	
C417,C701,C721,C741	01417-344-104	C-CERAMIC,HK:CK45(T) F50V 0.1M-Z	
C423	01607-906-109	C-ELEC. 105'C:CE04W 50V 1UF 105'C RA/KM	
C432,C433	01607-903-470	C-ELEC.105'C:CE04W 16V 47uF 105'C RA/KM	
C436	01417-329-102	C-CERAMIC,HK:CK45(T) D 50V 1000-M	
C437,C496,C497	01517-323-109	C-M,POLYESTER:CF922M 100V 1.0M-J	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
C438	01507-335-224	C-POLYPROPYLENE:CQ922M 200V 0.22M-K	
C439	01502-573-153	C-POLYPROPYLENE:CQ922M 1.6KV 0.015MF-J	!
C440	01502-554-333	C-POLYPROPYLENE:CQ922M 630V 0.033M-K	!
C441	916 656180TJAX	CAP-MPPF,184J,2G,15P:180NF,400V,5%,RE-R	
C442	01507-545-474	C-POLYPROPYLENE:CQ922M 400V 0.47M-K	
C443	01507-543-224	C-POLYPROPYLENE:CQ922M 400V 0.22-J	
C444	01502-544-104	C-POLYPROPYLENE:CQ922M 400V 0.1UF-J	
C446,C447,C448	01505-723-103	C-POLYESTER:CQ921M(T) 100V 0.01-J	
C449,C460,C473,C474	01608-904-470	C-ELECTROLYTIC:CE04W(T) 25V 47M	
C450	01609-401-460	C-ELECTROLYTIC:CE04W 16V 47M	
C471	01507-543-473	C-POLYPROPYLENE:CQ922M 400V 0.047-J	
C475	01417-344-472	C-CERAMIC HK:CK45(T) F 50V 4700-Z	
C476	01417-318-152	C-CERAMIC,HK:CC45(T) B50V 1500-K	
C479	01518-343-154	C-M.POLYPROYLENE:CF922M 400V 0.15-J	
C491	917 812470HM	CAP-AL.ELE,476M,1H,5X11,105C:(T)47UF	
C493,C494,C495	01407-048-101	C-CERAMIC TEMP:CC45(T) RH 50V 100-K	
C702,C722,C742	01502-553-102	C-POLYPROPYLENE:CQ922M 630V 0.001M-J	
C703,C723	01416-768-102	C-CERAMIC,HK:CK45 B 2KV 1000-K	
C743,C763	01417-768-151	C-CERAMIC, HK:CK45 B 2KV 150-K	
C747	01400-757-103	C-MONO MULTI:SR211C103JAATR(AVX)	
C761	01609-404-140	C-ELECTROLYTIC:CE04W 63V 47M	
C762	01400-757-104	C-MONO MULTI:SR211C104JAATR(AVX)	
CN304	03344-170-103	CONNECTOR-WAFER:3951P03VP01	
CN401	03344-112-011	CONNECTOR-WAFER:5273-11A MOLEX	
CN402	03344-168-910	CONNECTOR-WAFER:35300-1050-7	
CN403	03344-166-616	CONNECTOR-WAFER:2545P 16HUAL	
CN405	03344-155-940	CONNECTOR-PIN BASE:B4P-LV-TN	
CN406	03344-159-030	CONNECTOR-WAFER:5096-04C MOLEX	
D331,D403,D404,D405, D406,D407,D408,D410, D419,D420,D424,D425, D426,D427,D428,D429, D433,D434,D435,D436, D437,D438,D439,D450, D701,D705,D721,D725, D741	02169-301-417	DIODE:1N4148(T)	
D332,D414,D415	02169-201-057	DIODE:1N4001F	
D400	02169-404-797	DIODE-ZENER:UZ-16BM(T)	
D401	02169-205-200	DIODE:MUR10120E	
D402,D411	02169-304-350	DIODE:UF 5404 (GI)	
D409	02169-401-600	DIODE-ZENER:BZX 79C 5V6	
D412,D413	02169-218-097	DIODE:UF4004(T)	
D416,D417,D418	02169-201-080	DIODE:IN4004	
D421,D422,D702,D722, D742	02169-101-480	DIODE:IN4936(400V 1A)	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
D423	02169-401-590	DIODE-ZENER:BZX 79C 5V1	
D430	02169-218-077	DIODE:UF4001 (T)	
D703,D723,D743,D744	02169-201-620	DIODE:ESJA5406(FUSI)	
D704	02169-404-910	DIODE-ZENER:MTZ6.8C	
D724	02169-401-690	DIODE-ZENER:BZX79C7V5	
IC309	02109-308-870	IC-6 BIT DAC:TDA8444	
IC310	02109-301-610	IC-D/A CONVERTER:DAC-8800	
IC311	02119-101-620	IC-VERT:TDA1675	
IC400,IC701,IC721, IC741	881 903842AA	IC-LIN,3842,PWN CONTROL:DIP,8,300MIL	
IC401	02109-307-050	IC-CMOS PLL:MC14046B	
IC402	02109-307-120	IC-COMS:MC14011B	
IC403	02109-104-120	IC-CMOS:14053B(MOTOROLA)	
IC404	02119-202-010	IC-LINEAR:LM324(SST)	
IC406	02119-401-350	IC-OP,AMP:LM358(SST)	
IC407	02109-309-410	IC-I/O EXPANDOR:PC F8574/A	
IC408	02109-307-480	IC-CMOS:MC14504B	
IC412	02119-601-630	IC-LINEAR:LM317(SST)	
IC413	02119-601-700	IC-REGULATOR: MC7812C,SST	
IC761	02119-103-110	IC:LM1201	
L401,L403,L404,L405	02429-048-017	FERRITE-CORE:1.5MH+-20% (T)	
L402	02449-735-610	COIL-LINEARITY:HL2121C	#
LUG5	03054-223-730	LUG-TERMINAL,ASSY:AWG#18 BLK L-150	
Q319	02149-302-720	TRANSISTOR:TIP29C	
Q401	02139-307-420	TRANSISTOR:MPS3646	
Q402,Q410	02139-104-290	TRANSISTOR:PN2907	
Q403,Q405,Q761	02139-104-220	TRANSISTOR:MPS2222A	
Q404,Q406,Q701,Q721, Q741	02149-601-820	FET:VN2222LL	
Q407	02149-601-440	FET-N:IRF-740	
Q408	02149-302-720	TRANSISTOR:TIP29C	
Q409	891 290030AA	TR-PNP,TIP30C,TO-220:2W,-100V,-100V,-5V	
Q411	02119-601-420	IC-SHUNT REGULATOR:TL431C	
Q413	02149-302-280	TRANSISTOR:MJH16010A(WITH MICA) MOTOROL	
Q414	02149-601-460	FET-N:IRF840	
Q415,Q416,Q417,Q418	02149-601-450	FET-NP:IRF640	
Q420	02139-307-060	TRANSISTOR:VN0606M	
Q702	02149-601-430	FET:IRF610	
Q722,Q742	02149-601-440	FET-N:IRF-740	
Q762	02149-601-430	FET:IRF610	
R302,R480	01018-277-682	R-CARBON:RD 1/4T 6.8K-J	
R371	01018-277-224	R-CARBON:RD 1/4T 220K-J	
R372,R425,R427,R701	01018-277-474	R-CARBON:RD 1/4T 470K-J	
R375	01045-577-510	R-METAL, OXIDE:RS 2T 51-J	
R376,R464	01018-377-221	R-CARBON:RD 1/2T 220-J	

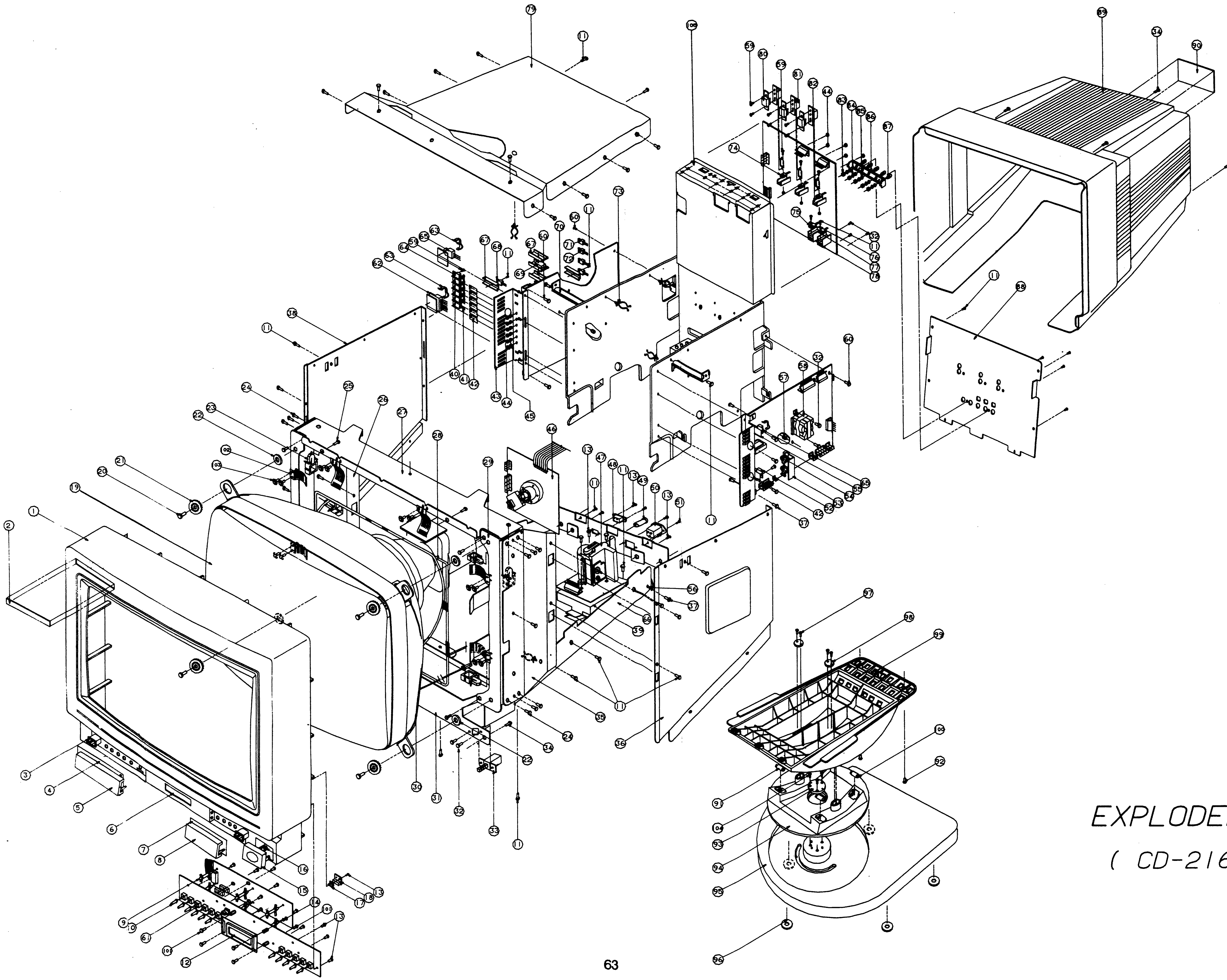
LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
R377,R381,R382,R426	01018-277-334	R-CARBON:RD 1/4T 330K-J	
R378,R379,R458,R708, R728,R748,R770	01018-277-472	R-CARBON:RD 1/4T 4.7K-J	
R380,R402,R424	01018-277-154	R-CARBON:RD 1/4T 150K-J	
R383,R449	01018-277-229	R-CARBON:RD 1/4T 2.2-J	
R384,R385	01018-277-123	R-CARBON:RD 1/4T 12K-J	
R386	01085-477-828	R-METAL, OXIDE:RS 1T 0.82-J	
R387	01018-277-911	R-CARBON:1/4T 910-J	
R388	01018-277-242	R-CARBON:RD 1/4T 2.4K-J	
R389	01085-577-241	R-METAL OXIDE:RJ 2T 240-J (S)	
R400,R403,R412,R413, R414,R416,R421,R429, R430,R438,R440,R462, R468,R499,R761,R763	01018-277-103	R-CARBON:RD 1/4T 10K-J	
R401,R483	01018-277-223	R-CARBON:RD 1/4T 22K-J	
R404	01018-277-563	R-CARBON:RD 1/4T 56K-J	
R405,R410,R436,R441, R492,R762,R767	01018-277-102	R-CARBON:RD 1/4T 1K-J	
R406,R769	01018-277-470	R-CARBON:RD 1/4T 47-J	
R407,R408,R411,R435, R459,R460,R463,R467, R494,R495,R497,R709, R729,R732,R749,R752	01018-277-222	R-CARBON:RD 1/4T 2.2K-J	
R409	01018-277-822	R-CARBON:RD 1/4T 8.2K-J	
R415	01018-377-229	R-CARBON:RD 1/2T 2.2-J	
R417	01048-177-100	R-METAL,FILM:RM 1/8T 10-J	
R419	01018-277-562	R-CARBON:RD 1/4T 5.6K-J	
R420	01018-277-753	R-CARBON:RD 1/4T 75K-J	
R422,R432,R433,R439, R442,R710,R730,R750	01018-277-104	R-CARBON:RD 1/4T 100K-J	
R423,R428,R466	01018-277-471	R-CARBON:RD 1/4T 470-J	
R431,R766	01018-277-330	R-CARBON:RD 1/4T 33-J	
R437,R702	01018-277-473	R-CARBON:RD 1/4T 47K-J	
R443,R475	01018-277-121	R-CARBON:RD 1/4T 120-J	
R444	01018-277-829	R-CARBON:RD 1/4T 8.2-J	
R445,R448,R455,R456, R457,R469,R470,R472, R473,R474,R498,R711, R731,R751,R764	01016-377-479	R-CARBON:RD 1/2T 4.7-J(S)	
R446,R450,R451,R452, R453,R454	01018-277-105	R-CARBON:RD 1/4T 1M-J	
R447	01085-577-439	R-METAL, OXIDE:RS 2T 4.3-J	
R461	01018-277-204	R-CARBON:RD1/4T,200K-J	
R471	01016-377-101	R-CARBON:RD 1/2T 100-J(S)	
R477	01016-377-221	R-CARBON:RD 1/2T 220-J(S)	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
R478,R733,R753	01016-377-109	R-CARBON:RD 1/2T 1-J(S)	
R481	01045-577-182	R-METAL OXIDE:RS 2T 1.8K-J	
R490	01016-377-100	R-CARBON:RD 1/2T 10-J(S)	
R491,R765	01016-377-229	R-CARBON:RD 1/2T 2.2-J(S)	
R704,R705,R706,R724, R725,R726,R727,R744, R745,R746,R747,R754	01016-377-475	R-CARBON:RD 1/2T 4.7M-J(S)	
R712	01018-277-272	R-CARBON:RD 1/4T 2.7K-J	
R713	01018-377-159	R-CARBON:RD 1/2T 1.5-J	
R715,R716,R735,R736, R755,R756	01085-677-471	R-METAL OXIDE:RS 3T 470OHM-J	
R721	01018-277-244	R-CARBON:RD 1/4T 240K-J	
R722	01018-277-333	R-CARBON:RD 1/4T 33K-J	
R741	01018-277-364	R-CARBON:RD-1/4T 360K-J	
R742	01018-277-393	R-CARBON:RD 1/4T 39K-J	
R768	01018-277-164	R-CARBON:RD 1/4T 160K-J	
R771	01038-527-331	R-WIRE, WOUND:RW 5W 330-J	
SK310	03354-705-950	SOCKET-IC:WSDIF-20PIN	
SK401	03354-705-930	SOCKET-IC:WSDIF-16PIN	
SK402	03354-705-920	SOCKET-IC:WSDIF-14PIN	
SK406	03354-705-910	SOCKET-IC:WSDIF-8PIN	
T401	02779-111-710	TRANS-S'CORRECT:EI33/29	!
T402	02899-004-610	TRANS-FBP:EI33/29	!
T403	02849-033-510	TRANS-HOR, DRIVE:EI22/19	!
T404	02899-004-710	TRANS-HOR. SENSE:EI22/19	!
T405	02899-005-010	TRANS-DRIVE CENTRING:E1 16/14	!
T406	02899-005-110	TRANS-DRIVE FET:E1 16/14	!
T701,T721,T741	02869-304-510	TRANS-DC OUTPUT:EI22/19	!
T761	02899-005-210	TRANS-FOCUS:E12219	!
YEL	00528-702-404	WIRE-VINYL,U/C:1007 #24(T)-YEL	
ASS'Y FRONT PCB			
R822	01018-277-105	R-CARBON:RD 1/4T 1M-J	
C804,C805	01407-017-250	C-CERAMIC TEMP:CC45 SL50V 25-J(T)	
C801,C802,C809	01604-906-100	C-ELECTROLYTIC:CE04W(T) 50V 10M 105'C	
D801,D802,D803,D804, D806,D807,D808,D810, D811,D812,D813,D814, D816,D817,D818,D820, D821,D823,D824,D831, D833,D834,D841	02169-301-417	DIODE:1N4148(T)	
SK805	03354-705-930	SOCKET-IC:WSDIF-16PIN	
SK803	03354-705-950	SOCKET-IC:WSDIF-20PIN	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
R801,R802,R803,R804,R806,R807,R808,R824,R831,R832,R834	911 132207YA	REF-CF,220,5%,1/6W:150V,-1300 TO +350PP	
R811,R812,R813,R815,R816,R817,R818,R819,R820,R823	911 151007YA	REF-CF,10K,5%,1/6W:150V,-1300 TO +350PP	
C803,C806,C807,C808,C810,C812,C815,C816,C817,C821,C822	915 266100HZAH	CAP-CERAMIC,104Z,1H:100NF,50V,+80-20%,Z	
IC802	02109-303-480	IC-MICOM:MC68HC11E1FN	
IC805	02109-305-760	IC-CMOS:74HC139	
IC803	02109-305-770	IC-CMOS:74HC373	
IC804	02109-402-900	IC-EPROM:D27128A(INTEL)	
IC806	02119-501-540	IC-LINEAR:MC34064P	
IC801	02119-602-010	IC-REGULATOR:MC7805(SST)	
Q801	02139-104-220	TRANSISTOR:MPS2222A	
Q803	02139-104-290	TRANSISTOR:PN2907	
CN801	03053-612-310	CONN 16PIN FLAT ASSY:2595S, 2504S, 350M	
CN803	03344-169-103	CONNECTOR-HEADER:2566P03TL34(E:8MM)	
CN802	03344-169-104	CONNECTOR-HEADER:2566P04TL34(E:8MM)	
SK804	03354-705-970	SOCKET-IC:WSDIF-28PIN	
SK802	03354-709-310	SOCKET-IC:8100-52T000	
TAL801	04539-035-310	CRYSTAL:8.00MHZ	
VR851	01246-101-192	VR-SEMI:EVN-F6S A00 B14 HORI CEMENT(T)	
IC851,IC852	02109-309-410	IC-I/O EXPANDOR:PC F8574/A	
LCD851	02339-100-210	LCD:HDM-16216D-2-VCO	
LUG6	03054-223-730	LUG-TERMINAL,ASSY:AWG#18 BLK L-150	
LUG7	03054-223-730	LUG-TERMINAL,ASSY:AWG#18 BLK L-150	
PT1	03124-702-810	PIN-SINGLE ROUND:IRP10001120 (LEOCO)	
CN854	03344-164-114	CONNECTOR-SOCKET:2543S16VU00	
	03344-166-114	CONNECTOR-HEADER:2558P16UA00	
CN853	03344-169-003	CONNECTOR-SOCKET:3594S03VU00	
CN851	03344-169-004	CONNECTOR-SOCKET:3594S04VU00	
CN852	03349-062-020	CONNECTOR-WAFER:5045-03A MOLEX	
SK851	03354-705-930	SOCKET-IC:WSDIF-16PIN	
SW851	03559-700-910	SWITCH-TACT:KHH 15912	
R851,R852	01018-277-101	R-CARBON:RD 1/4T 100-J	
R889	01018-277-103	R-CARBON:RD 1/4T 10K-J	
R888	01018-277-120	R-CARBON:RD 1/4T 12-J	
C853,C854,C855,C856	01400-159-104	C-MONOLITHIC CERAMIC:CZ20C 104M 244(CEN)	
C851,C852	01407-018-101	C-CERAMIC TEMP:CC45(T) SL 50V 100-K	
D851,D852,D853,D854,D855,D856,D857,D858,D859,D861,D862,D863,D864,D860,D865	02169-301-417	DIODE:1N4148(T)	

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
ASS,Y CDT PCB			
R901,R903,R904,R905	01028-378-101	R-COMPOSITION:ERC12GK101V(RC 1/2T 100-K	
R902,R907,R908	01028-378-103	R-COMPOSITION:ERC12GK103V(RC 1/2T 10K-K	
GT PIN	03124-700-810	PIN-GT:14.2MM 2.35PI	
C901	01416-780-103	C-CERAMIC,HK:CK45 E2KV 0.01UF-P	
CN902	03344-112-020	CONNECTOR-WAFER:5273-03A	
CN903	03344-159-030	CONNECTOR-WAFER:5096-04C MOLEX	
SKT901	03354-709-210	SOCKET-CRT:S008746 (NON-GAP)	
SG901,SG902,SG903, SG904	04569-002-210	SPARK GAP:DSP-301N	
R906,R909	911 619107PU	REF-WW,9.1,5%,5W:-,-200 TO +200PPM/C,R	
CN904	955 460156AZAA	CBF-CONN ASSY,110MM,7P:7P CRT (2167SC)	
CN902+	955 460163AAAA	CBF-CONN ASSY,100MM,3P:3P CRT (2167SC)	
4P7+CO	955 460165AAAA	CBF-CONN ASSY,200MM,4P:4P7 CRT (2167SC)	
SUB MATERIALS			
	0C904-000-6300	ASS'Y-LED:CD-2167SC	
	02309-110-040	LED:LD701MG	
	02859-132-210	TRANS-FLYBACK:C88LUI-RC (HIGH FOCUS)	
	03344-167-702	CONNECTOR-STRAIGHT HEADER:3951P02V000	
	947 460012HA	PCB-LED,CD-2167SC,FR-4:19X23X1.6T,FR-4	
	955 460157AAAA	CBF-CONN ASSY,400MM,2P:2P LED (2167SC)	
	06502-702-710	CONTROL-DOOR.L:CHEIL STAROY VB1108R V0	
	06502-702-810	CONTROL-DOOR.R:CHEIL STAROY VB1108R V0	
	07622-706-110	KNOB-POWER:CHEIL STAROY VB1108R V0 #C81	
	07652-700-810	WINDOW-LCD:ACRYL NTR	
	07653-702-110	LENS-LED:ACRYL CLEAR MD-2197DA	
	08113-719-010	LABEL-CONTROL.L:POLYCABONATE T0.177	
	08113-719-110	LABEL-CONTROL.R:POLYCABONATE T0.177	
	02479-015-810	COIL-DEGAUSSING:CD-2167SC	
	257 213000CKBE	ASSY-SEL S/W:1677G, SC-CHA	FTZ
	257 213000FEAD	ASSY-AC INPUT:1677G, SC-CHA	FTZ
	03364-700-310	HOLDER-FUSE:345-621 (20MM)	
	04709-084-970	FUSE:50T 250V 3.15A 20mm-C SEMKO	!, 220V
	04709-088-060	FUSE:3A 51S	!, 110V

LOCATION NO.	CODE NO.	DESCRIPTION : SPECIFICATION	REMARK
CDT			
	257 211134GJAA	ASSY-20CDT:FLT,NG,31,AR	
	03053-301-210	GND, CRT-ASSY:0.12X8X16 CC9511	
	897 250085AA	CRT,COLOR,21":M51KTD13XX20	
	257 211134GMAA	ASSY-20CDT:FLT,NG,26,CSC1677 AR	
	02019-250-810	CRT-COLOR:E8215B22-TC05GTAR	
	03053-301-210	GND, CRT-ASSY:0.12X8X16 CC9511	
	257 211134GMAB	ASSY-20CDT:FLT,NG,26,CSC1677G,AR	
	02019-250-810	CRT-COLOR:E8215B22-TC05GTAR	
	955 460377AAAA	CBF-CRT GND ASSY:CSC1677G,UL1015#22 BLK	FTZ
PCB ASS'Y CODE N			
	257 211044AAAC	PWA-PWR:SC-CHA,HOLDER,FCC,COMM	
	257 211044AAAD	PWA-PWR:1677G,CLOP,FTZ,COMM	FTZ
	257 211070AAAM	PWA-VIDEO:SC-CHA,FCC,DOM	
	257 211080AADJ	PWA-MAIN:SC-CHA,DOM,FCC	
	257 211093AAAB	ASS'Y-CTRL:SC-CHA,DOM	
	257 211101AAAH	PWA-CRT:SC-CHA,DOM	
	257 211134GJAA	ASSY-20CDT:FLT,NG,0.31DOT,AR	
	257 211134GMAA	ASSY-20CDT:FLT,NG,0.26DOT,AR,CSC1677	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EXPLODED VIEW

(CD-2167SC)

NO.	DESCRIPTION	CODE-NO.	SPECIFICATION	Q'TY	REMARK
1.	COVER-FRONT	6000-741-010	STAROY VB1108R #C8117	1EA	
2.	FRONT-LOGO	825 129164GA	CU SHEET T0.5 SAMSUNG	1EA	SAMSUNG
3.	DOOR-PUSH,S/W	6632-700-710	LA701-3AA	2EA	
4.	LABEL-CONTROL,L	8113-719-010	POLYCABONATE T0.178	1EA	
5.	CONTROL-DOOR,L	6052-702-710	STAROY VB1108R #C8117	1EA	
6.	WINDOW-LCD	7652-700-810	ACRYL NTR	1EA	
7.	LABEL-CONTROL,R	8113-719-110	POLYCABONATE T0.178	1EA	
8.	CONTROL-DOOR,R	6052-702-810	STAROY VB1108R #C8117	1EA	
9.	SPACER-LOCK	6603-705-810	DASS-L16N	6EA	
10.	KNOB-CONTROL	7623-712-510	ABS V0 WHT	11EA	
11.	SCREW-TAP,RH	7148-530-061	2S-3X6 FE FZY	54EA	
12.	LCD	2339-100-210	HDM-16216D-2-VC5	1EA	
13.	SCREW-TAP,RH	7148-530-101	2S-3X10 FE FZY	14EA	
14.	SPACER-STANDOFF	6603-705-710	ST4-8	4EA	
15.	KNOB-POWER	7622-706-010	STAROY VB1108R #C8117	1EA	
16.	SPRING-POWER	6674-718-210	SWRM,0.5X6X28 W/WASHER	1EA	
17.	LENS-LED	7653-702-110	ACRYL NTR	1EA	
18.	ASSY-LED	0C904-000-6300	CSC167*	1EA	
19.	CRT-COLOR	2019-250-810	E8215B22-TC**	1EA	
20.	SCREW-TAP,TH	7128-550-201	2S-5X20 FE FZY	4EA	
21.	WASHER-SPRING	7334-700-710	SPC-1 T1.6 FZY2	4EA	
22.	RUBBER-CRT	6834-705-210	NEOPRENE HB BLK	4EA	
23.	SADDLE-WIRE	6813-700-410	NYLON 66 NTR	6EA	
24.	SCREW-TAP,RH	7148-540-061	2S-4X6 FE FZY	18EA	
25.	SCREW-TAP,RH	7148-540-161	2S-4X16 FE FZY	2EA	
26.	FRAME-LEFT	6611-706-410	SECC-1 T1.0	1EA	
27.	FRAME-TOP	6611-706-010	SECC-1 T1.0	1EA	
28.	COIL-DEGAUSSING	2479-015-610	701X70 (CD-2167SC)	1EA	
29.	BRACKET-CRT	6611-706-210	SECC-1 T1.6	2EA	
30.	GND. CRT ASSY	3053-301-210	0.12X8X16E FZW	1EA	
31.	FRAME-BOTTOM	6611-706-110	SECC-1 T1.0	1EA	
32.	SCREW-RH	7048-130-061	+M3X6 FE FZY	12EA	
33.	ASSY-POWER,S/W	0C905-000-5440	CSC167*	1EA	
34.	SCREW-TAP,TH	7128-540-162	2S-4X16 FE FZW	6EA	
35.	FRAME-RIGHT	6611-706-310	SECC-1 T1.0	1EA	
36.	SHIELD-RIGHT	4540-700-910	SECC-1 T1.0	1EA	
37.	SCREW-TATITE	7027-140-081	+TM4X8 FE FZY	10EA	
38.	SHIELD-LEFT	4540-701-010	SECC-1 T1.0	1EA	
39.	FRAME-FBT	6612-712-910	SECC-1 T1.2	1EA	
40.	FET-N	2149-601-460	IRF840	1EA	
41.	FET-N	2149-601-450	IRF640	4EA	
42.	PLATE-MICA	3914-100-340	5-13X19 T0.9 RECF	7EA	
43.	HEATSINK-PD	5682-707-210	A1050S T2.0	2EA	
44.	NUT-HEX	7208-113-001	1-M3 FE FZY	18EA	
45.	INSULATOR	3934-103-110	4.5-8D 2-2H N66 V0	10EA	
46.	ASSY-CRT PCB	0C904-000-6340	CSC167*	1EA	
47.	ASSY-FBT	0C905-000-5470	CSC167*	1EA	
48.	ASSY-SELET S/W	0C905-000-5420	CSC167*	1EA	
49.	ASSY-AC,INPUT	0C905-000-5430	CSC167*	1EA	
50.	SOCKET-NOISE FILTER	3354-706-910	1A5-S32 250V 3A	1EA	
51.	SCREW-TAP,FH	7118-530-083	2S-3X8 FE FZB	2EA	
52.	FET-N	2169-601-440	IRF740	1EA	
53.	HEATSINK-P,TR	5682-707-110	A1050S T2.0	1EA	
54.	FET-N	2169-601-440	IRF740	2EA	
55.	RUBBER-SILICON	6834-704-110	20X30X0.45T	3EA	
56.	WASHER-TOOTHED	7328-205-001	B PI 5.0 FE FZY	1EA	
57.	SPACER-SUPPORT	3529-705-020	DACN-6N	2EA	
58.	TRANCE-SMPS	2879-007-110	PQ5050,H7C1-129	1EA	
59.	SCREW-RH	7048-130-061	+M3X6 FE FZY	14EA	
60.	SCREW-TAP,PH	7094-700-620	2S-3X10 FE FZY W/WASHER	6EA	
61.	SWITCH-TACT	3559-700-810	KHH10912	11EA	
62.	IC-VERT	2119-101-620	TDA1675	1EA	
63.	SPRING TR	6673-702-310	STS301 T0.4	5EA	
64.	DIODE	2169-205-200	MUR10120E	1EA	
65.	TRANSISTOT	2159-301-750	MJH16206	2EA	
66.	CHASSIS-BOTTOM	6610-700-910	SECC-1 T1.2	1EA	
67.	HEATSINK-TR	5683-706-210	A1050S T2.0	6EA	
68.	TRANSISTOT	2149-302-720	TIP29C	1EA	
69.	IC-LINEAR	2119-601-630	LM317	1EA	
70.	BRACKET-SUPPORT	6613-723-110	SECC-1 T1.0	2EA	
71.	FET	2149-601-430	IRF610	2EA	
72.	FET-N	2169-601-440	IRF740	2EA	
73.	HOLDER-WIRE	6604-706-911	DAWH-18NB	5EA	
74.	TRANSISTOT	2139-302-350	2SC350	3EA	
75.	IC-REGULATOR	2119-602-010	MC7805	1EA	
76.	WASHER-LEX	7304-701-110	SBC-1 T1.5 NI	2EA	
77.	IC-REGULATOR	2119-601-130	MC7812	1EA	
78.	HEATSINK-TR	5683-706-210	A6063 EXTR BLK	2EA	
79.	SHIELD-TOP	4540-700-810	SECC-1 T0.5	1EA	
80.	IC-VIDEO	2119-101-850	CR2424	3EA	
81.	HEATSINK-CR2424	5683-709-510	A6063S EXTR	3EA	
82.	HEATSINK-TR	5683-709-230	A1050S T1.0	3EA	
83.	JACK-BNC	3399-100-110	227754-1	5EA	
84.	WASHER-BNC	5114-704-610	SM20C	5EA	
85.	JACK-BNC	3399-100-110	227754-1	5EA	
86.	BRACKET-BNC	6612-711-810	BSS3 T1.0	1EA	
87.	JACK-BNC	3399-100-110	227754-1	5EA	
88.	SHIELD-REAR	4541-705-010	SECC-1 T1.0	1EA	
89.	COVER-REAR	6000-742-010	STAROY VB1108R #C8117	1EA	
90.	LABEL-RATING	8033-771-010	POLYESTER T0.166	1EA	
91.	BUSHING	5113-700-310	SM20C	4EA	
92.	SCREW-TAP,TH	7128-540-101	2S-4X10 FE FZY	3EA	
93.	STOPPER	8303-700-910	STAROY VB1108R #C8117	1EA	
94.	STAND-TOP	8303-705-010	STAROY VB1108R #C8117	1EA	
95.	STAND-BASE	8300-710-010	STAROY VB1108R #C8117	1EA	
96.	FOOT-STAND	6834-702-710	NEOPRENE V0 WHT	5EA	
97.	SCREW-TAP,RH	7148-530-161	2S-3X16 FE FZY	4EA	
98.	STAND-STOPPER	8302-701-110	GE NORYL PX-1005	2EA	
99.	COVER-BOTTOM	6000-743-010	STAROY VB1108R #C8117	1EA	
100.	BAR	5113-700-410	SM20C	4EA	
101.	SCREW-TAP,PH	7108-530-061	2S-3X6 FE FZY	8EA	
102.	EARTH-PLATE	815-462013AA	PBS3 T0.3 FZY	6EA	
103.	SCREW-TAP,PH	7108-126-041	2S-3X6 FE FZY W/WASHER	12EA	
104.	SCREW-TAP,FH	7118-540-152	2S-4X15 FE FZW	3EA	
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106.					
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DISASSEMBLY INSTRUCTIONS

As you see the disassembly diagram, you can disassemble the PCB from the chassis as the following.

1. Disassemble cabinet

(1).Remove the 4 screw(1)retaining the rear cabinet(COVER-REAR).

(2).Remove the 4 screw(2)retaining the front cabinet(COVER-FRONT).

2. Disassemble chassis

(1).Remove the 12 screw(3)retaining the chassis top(CHASSIS-TOP).

(2).Remove the 6 screw(4)retaining the shield rear(SHIELD-REAR).

(3).Remove the 5 screw(5)retaining the shield right(SHIELD-RIGHT).

(4).Remove the 5 screw(6)retaining the shieldleft(SHIELD-LEFT).

3. Disassemble PCB

(1).Remove the 1 screw(7)retaining the power PCB.

(2).Remove the 1 screw(8)retaining the main PCB.

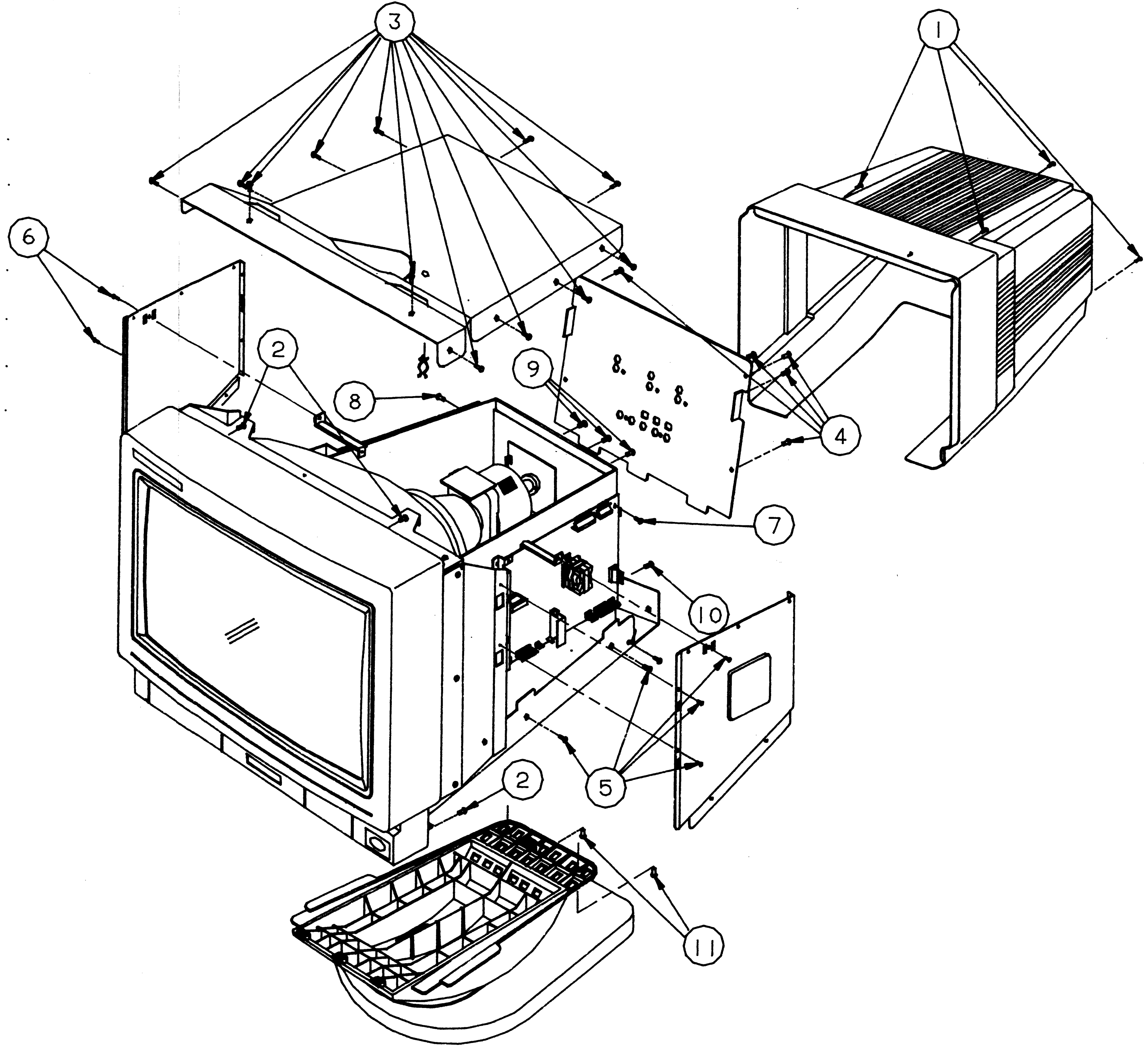
(3).Remove the 6 screw(9)retaining the video PCB.

4. Disassemble chassis frame

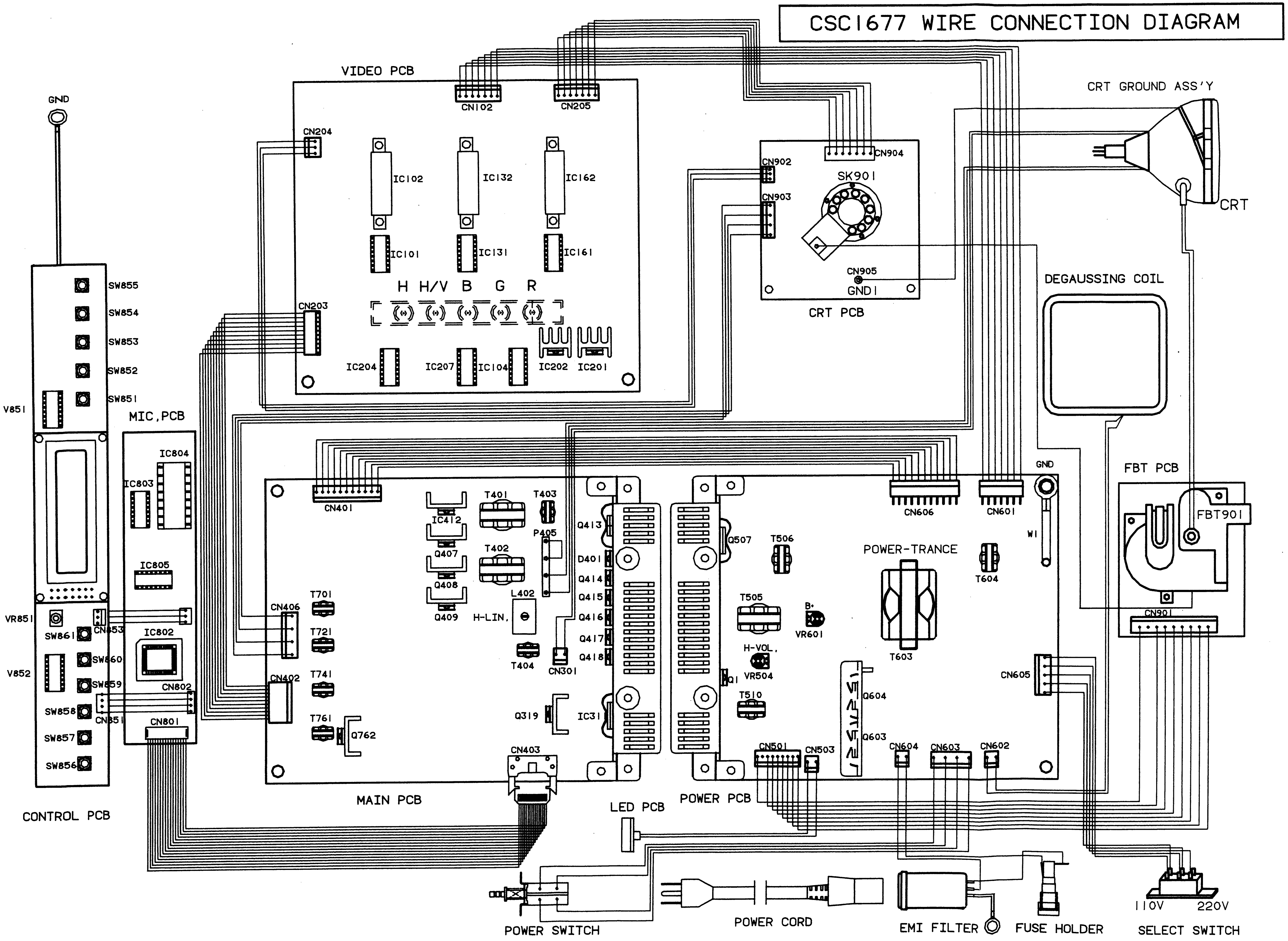
(1).Remove the 2 screw(10)retaining the chassis frame Assy.

5. Disassemble stand

(1).Remove the 2 screw(11)retaining the stand Assy.

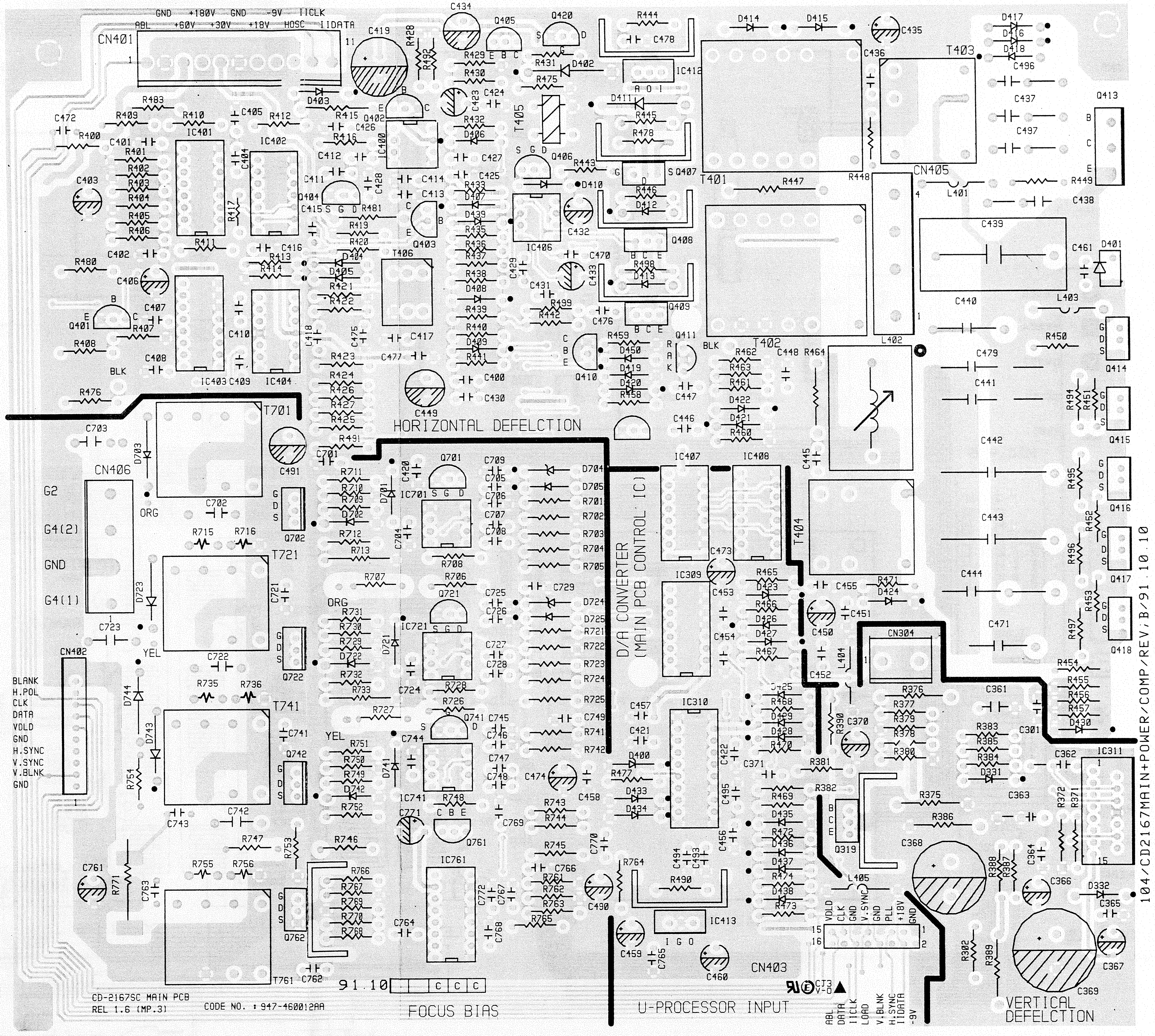


CSC1677 WIRE CONNECTION DIAGRAM

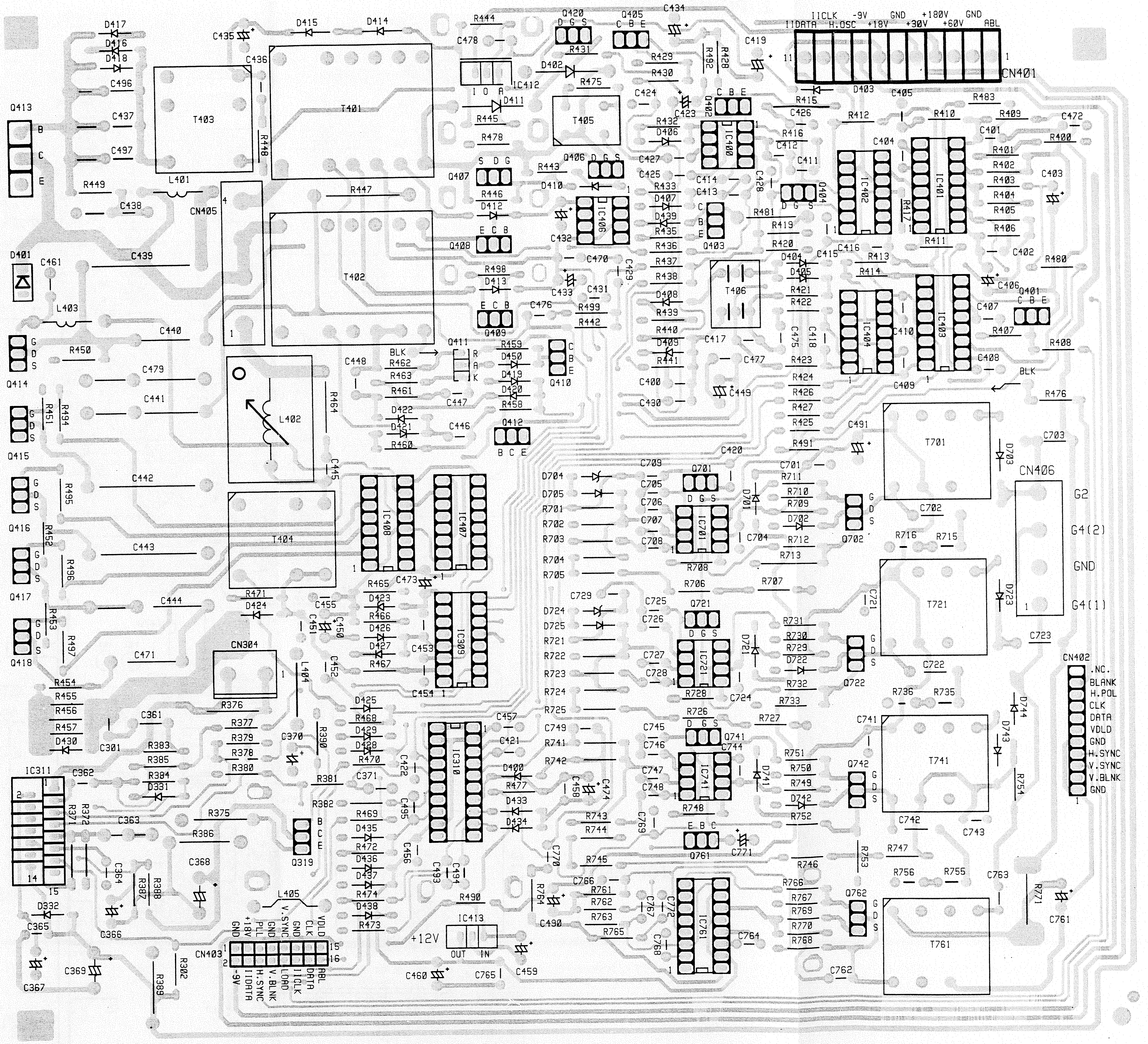

VIDEO PCB
CN102
CN205
CN204
IC102
IC132
IC162
IC101
IC131
IC161
H H/V B G R
CN203
IC204
IC207
IC104
IC202
IC201
CN902
CN904
SK901
CN903
CN905
GND1
CRT PCB
CRT GROUND ASS'Y
CRT
DEGAUSSING COIL
GND
SW855
SW854
SW853
SW852
SW851
V851
MIC,PCB
IC804
IC803
IC805
IC802
CN802
CN801
VR851
SW861
CN853
SW860
V852
SW859
SW858
CN851
SW857
SW856
CONTROL PCB
CN401
T401
T403
IC412
Q407
T402
Q408
Q409
H-LIN.
L402
P405
Q413
D401
Q414
Q415
Q416
Q417
Q418
CN406
T701
T721
CN402
T741
T761
Q762
T404
CN301
Q319
IC31
CN403
MAIN PCB
LED PCB
POWER PCB
CN606
CN601
GND
W1
Q507
T506
POWER-TRANCE
T604
T505
B+
VR601
H-VOL.
VR504
T603
Q1
T510
Q604
Q603
CN605
CN501
CN503
CN604
CN603
CN602
FBT PCB
FBT901
CN901
POWER SWITCH
POWER CORD
EMI FILTER
FUSE HOLDER
110V
220V
SELECT SWITCH

PRINTED WIRING BOARD

1. MAIN PWB

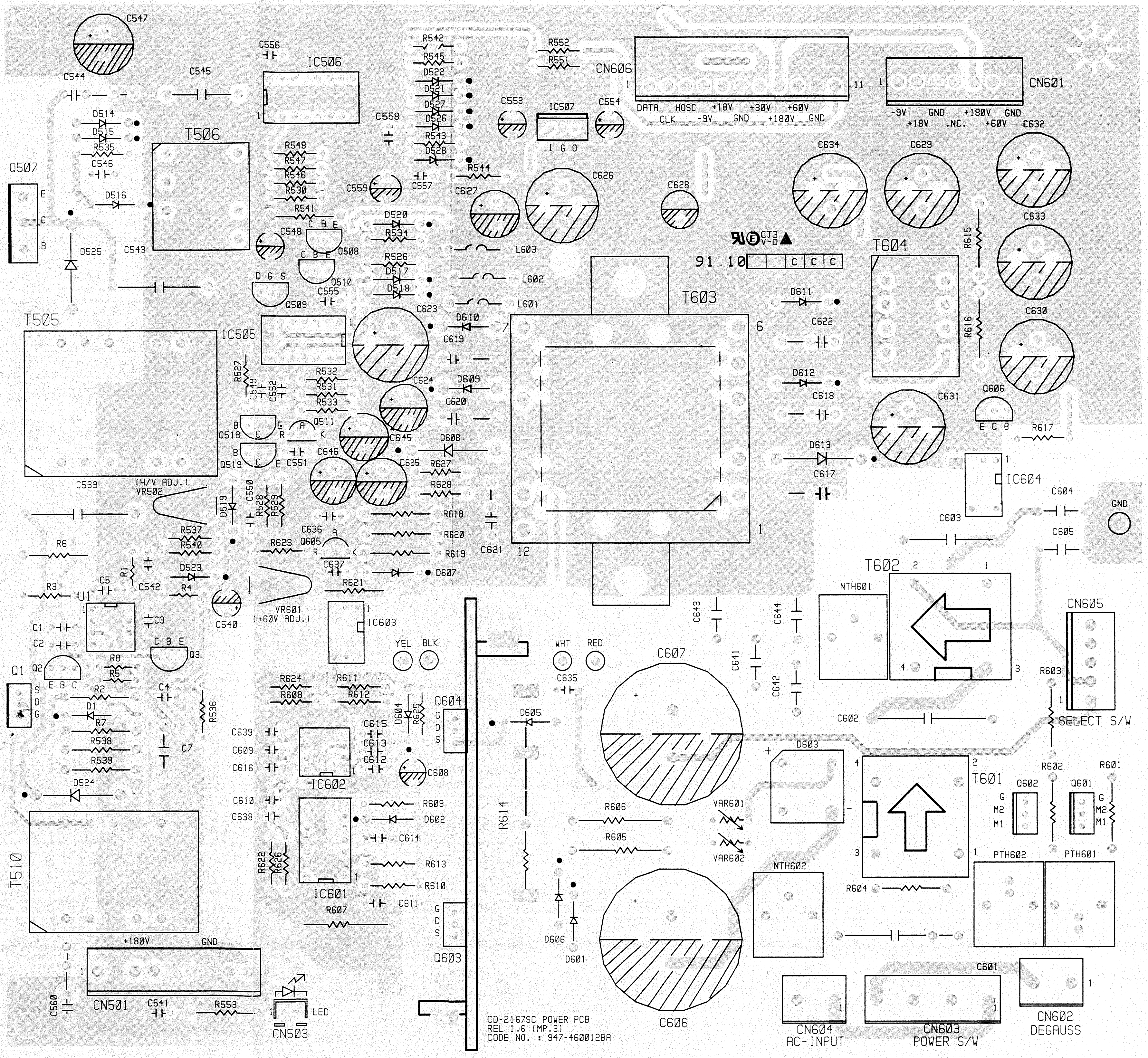

CN401
GND +180V GND -9V IICLK
ABL +60V +30V +18V HOSC IIDATA
HORIZONTAL DEFELCTION
T701
CN406
G2
G4(2)
GND
G4(1)
ORG
YEL
T721
T741
T761
CN402
BLANK
H.POL
CLK
DATA
VDLD
GND
H.SYNC
V.SYNC
V.BLNK
GND
D/A CONVERTER
(MAIN PCB CONTROL IC)
T401
T402
T403
T404
T405
T406
CN405
CN304
CN403
IC309
IC310
IC311
IC413
91.10
FOCUS BIAS
U-PROCESSOR INPUT
ABL
DATA
IICLK
LOAD
V.BLNK
H.SYNC
IIDATA
-9V
VERTICAL
DEFELCTION
CD-2167SC MAIN PCB
REL 1.6 (MP.3)
CODE NO. : 947-460012AA
104/CD2167MAIN+POWER/COMP/REV/B/91.10.10

(TOP VIEW)

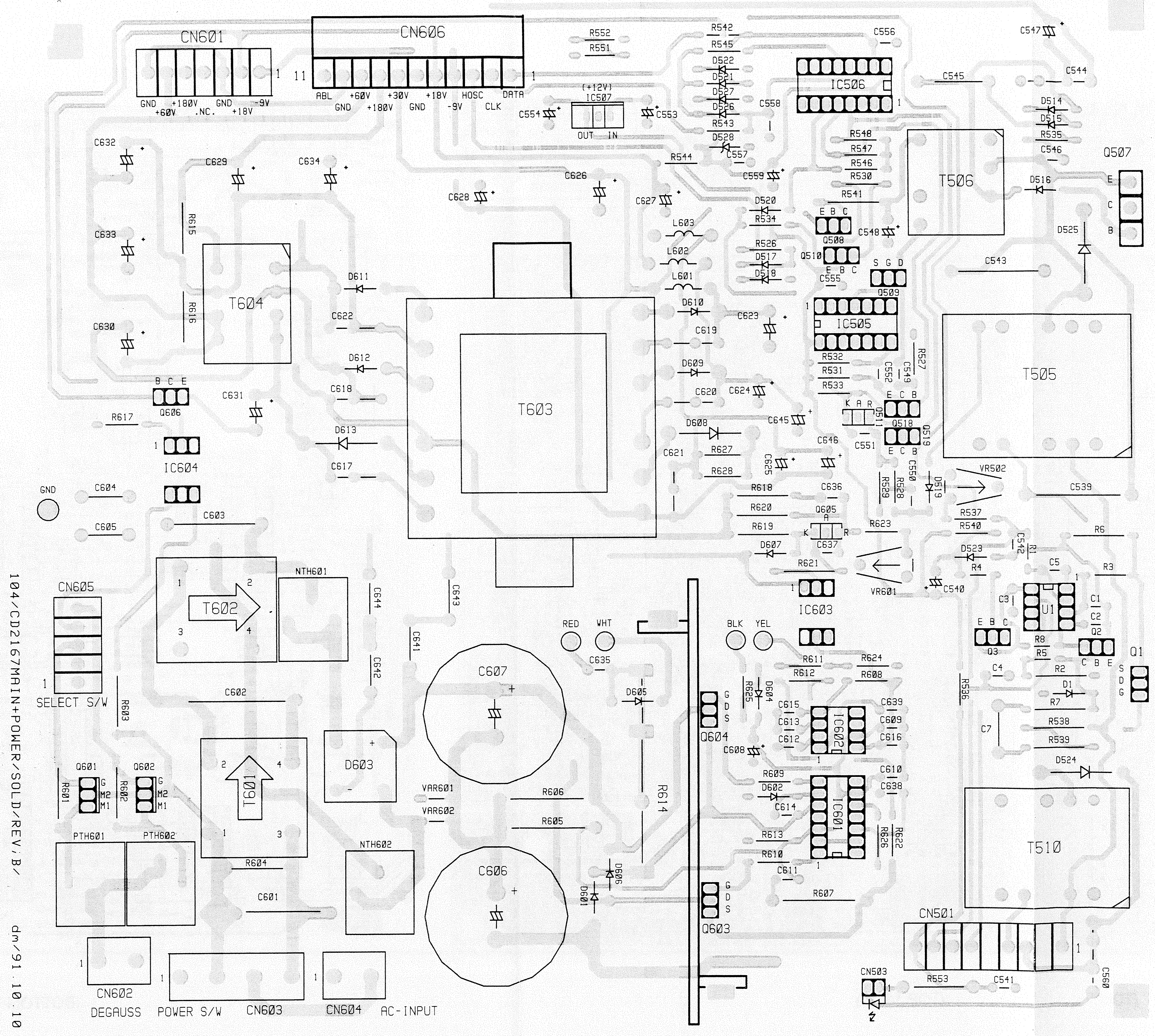

CN401
IICLK
-9V
GND
+180V
GND
IIDATA
H.OSC
+18V
+30V
+60V
ABL
CN406
G2
G4(2)
GND
G4(1)
CN402
.NC.
BLANK
H.POL
CLK
DATA
VDLD
GND
H.SYNC
V.SYNC
V.BLNK
GND
CN403
GND
+18V
PLL
GND
V.SYNC
GND
LOAD
CLK
VDLD
-9V
IIDATA
H.SYNC
V.BLNK
LOAD
IICLK
DATA
ABL
+12V
OUT
IN
IC413
T401
T402
T403
T404
T405
T406
T701
T721
T741
T761
L401
L402
L403
L404
L405
CN304
CN405
IC311
IC309
IC310
IC400
IC401
IC402
IC403
IC404
IC406
IC407
IC408
IC412
IC701
IC721
IC741
IC761
BLK

(BOTTOM VIEW)

2. POWER PWB

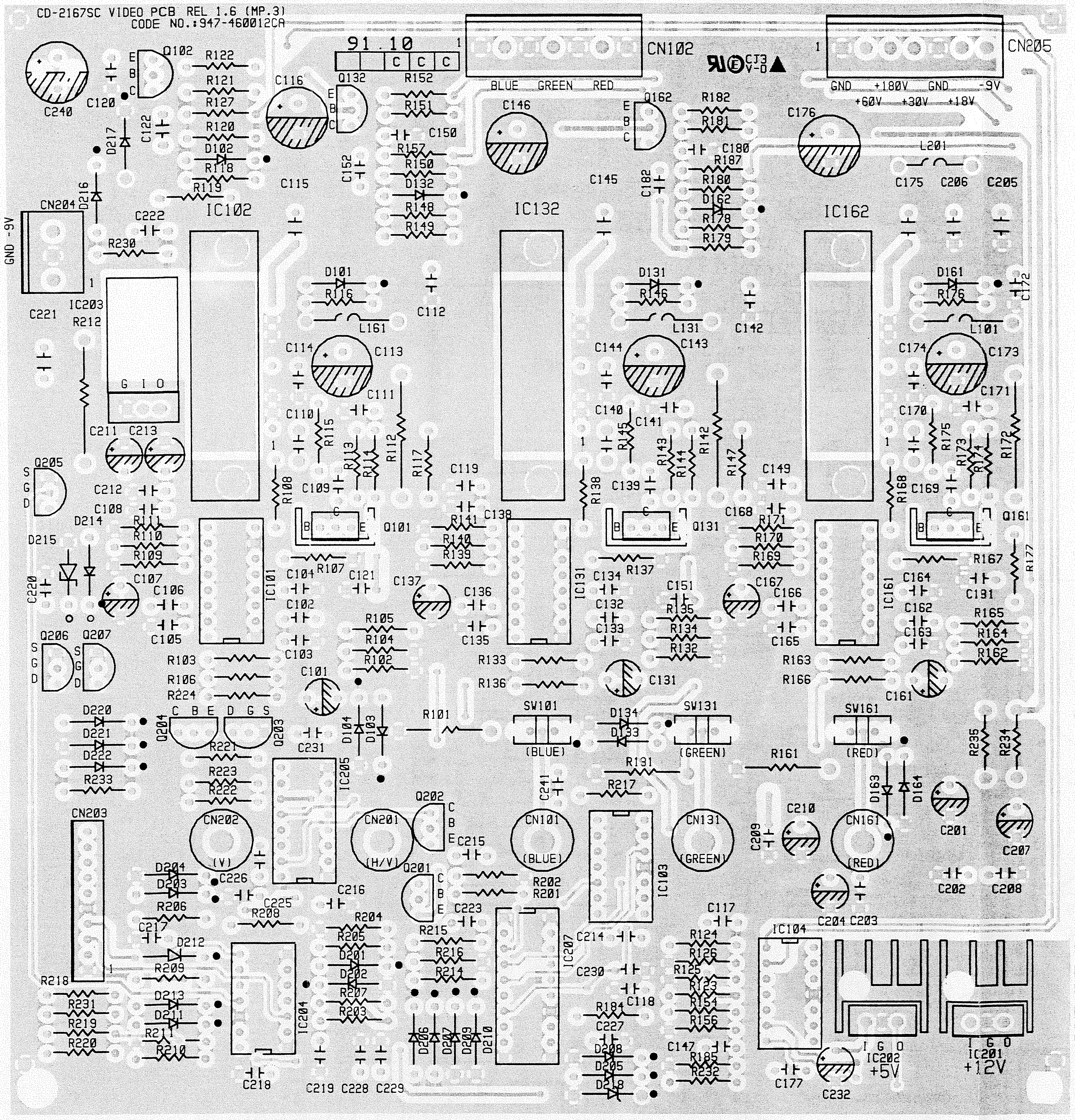

C547
C556
IC506
C544
C545
D514
D515
R535
C546
T506
Q507
D516
D525
C543
T505
IC505
CN606
DATA HOSC +18V +30V +60V
CLK -9V GND +180V GND
CN601
-9V GND +180V GND
+18V .NC. +60V
C553
IC507
I G O
C554
C558
C559
C557
C627
C626
C628
C634
C629
C632
C633
C630
C631
T603
T604
Q606
R617
R615
R616
L603
L602
L601
D611
C622
D612
C618
D613
C617
91.10
IC604
C604
C603
C605
GND
C539
(H/V ADJ.)
VR502
VR601
(+60V ADJ.)
R6
R3
R1
C5
C542
R4
U1
C1
C2
C3
Q3
Q1
Q2
E B C
R8
R5
R2
D1
R7
R538
R539
C4
C7
R536
D524
T510
+180V
GND
CN501
C560
C541
R553
CN503
LED
IC603
YEL BLK
WHT RED
C635
Q604
D604
C639
C609
C616
C615
C613
C612
C608
IC602
C610
C638
R609
D602
C614
R613
R610
C611
IC601
R607
R622
Q603
R614
D605
D606
D601
C607
C606
C643
C644
C641
C642
C602
T602
NTH601
CN605
R603
SELECT S/W
D603
T601
R602
R601
Q602
Q601
G
M2
M1
R606
R605
VAR601
VAR602
NTH602
R604
PTH602
PTH601
C601
CN604
AC-INPUT
CN603
POWER S/W
CN602
DEGAUSS
CD-2167SC POWER PCB
REL 1.6 (MP.3)
CODE NO. : 947-4600128A

(TOP VIEW)

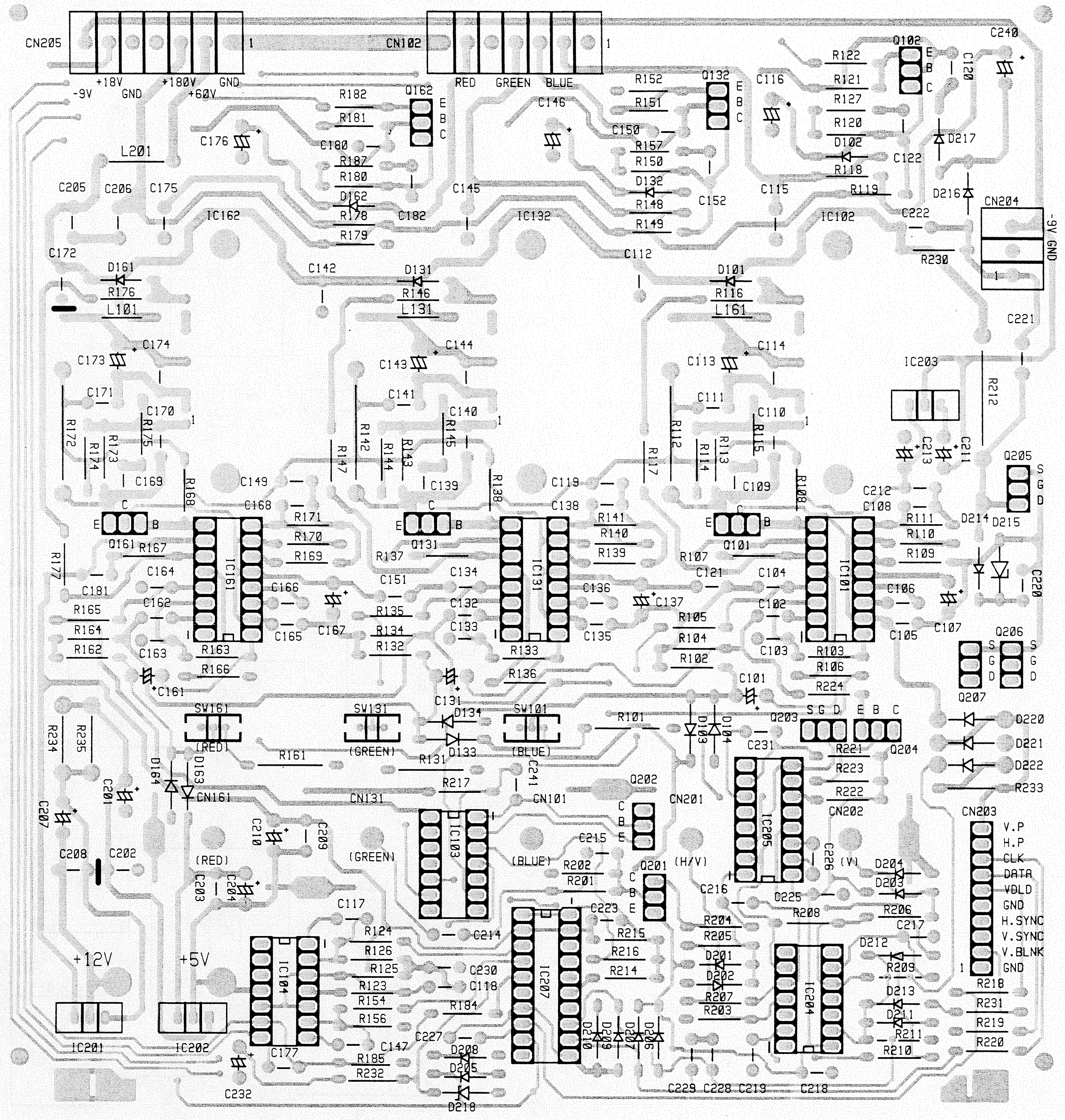

CN601
GND +180V GND -9V
+60V .NC. +18V
CN606
ABL +60V +30V +18V HOSC DATA
GND +180V GND -9V CLK
(+12V) IC507
OUT IN
IC506
T506
Q507
E C B
T604
T603
T505
IC505
Q508
Q510
Q509
Q518
Q606
IC604
IC603
Q605
VR502
VR601
U1
Q1
Q2
Q3
GND
CN605
SELECT S/W
T602
NTH601
T601
D603
C607
C606
VAR601
VAR602
R614
RED WHT BLK YEL
Q604
Q603
IC602
IC601
T510
CN501
CN503
Q601
Q602
PTH601
PTH602
NTH602
CN602
DEGAUSS
POWER S/W
CN603
CN604
AC-INPUT
104/CD2167MAIN+POWER/SOLD/REV:B/
dm/91.10.10

(BOTTOM VIEW)

3. VIDEO PWB


CD-2167SC VIDEO PCB REL 1.6 (MP.3)
CODE NO.:947-460012CA
91.10
CN102
CN205
BLUE GREEN RED
GND +180V GND -9V
+60V +30V +18V
IC102
IC132
IC162
CN204
GND -9V
IC203
IC101
IC131
IC161
SW101 (BLUE)
SW131 (GREEN)
SW161 (RED)
CN203
CN202 (V)
CN201 (H/V)
CN101 (BLUE)
CN131 (GREEN)
CN161 (RED)
IC205
IC204
IC207
IC103
IC104
IC202 +5V
IC201 +12V

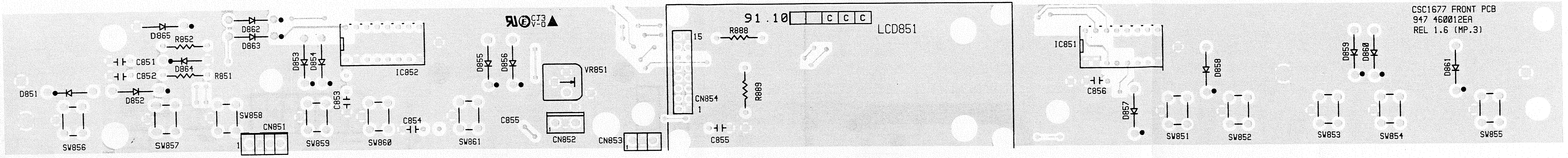
(TOP VIEW)


CN205
CN102
+18V -9V GND +180V +60V GND
RED GREEN BLUE
L201
IC162
IC132
IC102
CN204
-9V GND
IC203
IC161
IC131
IC101
SW161 (RED)
SW131 (GREEN)
SW101 (BLUE)
CN161
CN131
CN101
CN201 (H/V)
CN202 (V)
CN203
V.P
H.P
CLK
DATA
VOLD
GND
H.SYNC
V.SYNC
V.BLNK
GND
IC205
IC204
IC207
IC103
IC104
+12V
+5V
IC201
IC202

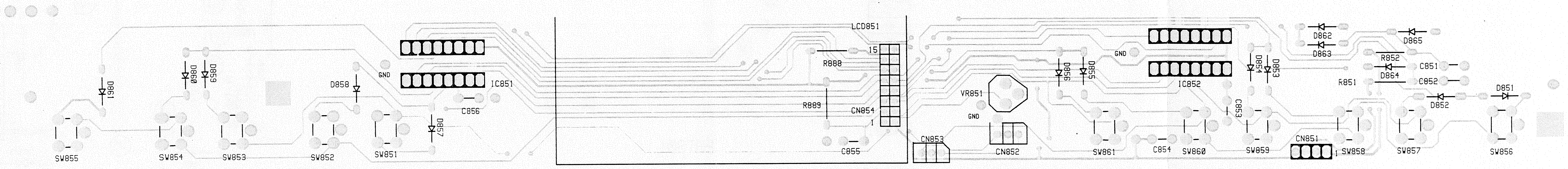
(BOTTOM VIEW)

4. OTHERS PWB

-. FRONT PWB

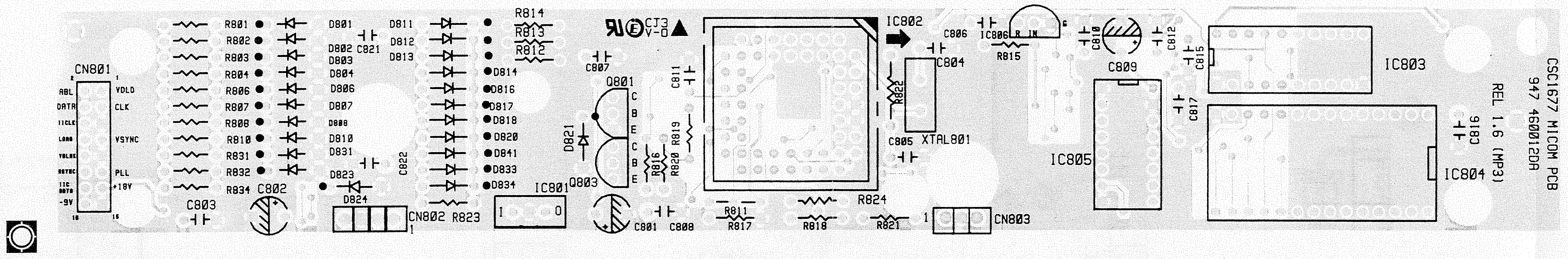

CSC1677 FRONT PCB
947 460012EA
REL 1.6 (MP.3)
91.10
LCD851
IC851
IC852
VR851
CN851
CN852
CN853
CN854
R888
R889
D851
D852
D853
D854
D855
D856
D857
D858
D859
D860
D861
D862
D863
D864
D865
R851
R852
C851
C852
C853
C854
C855
C856
SW851
SW852
SW853
SW854
SW855
SW856
SW857
SW858
SW859
SW860
SW861

(TOP VIEW)

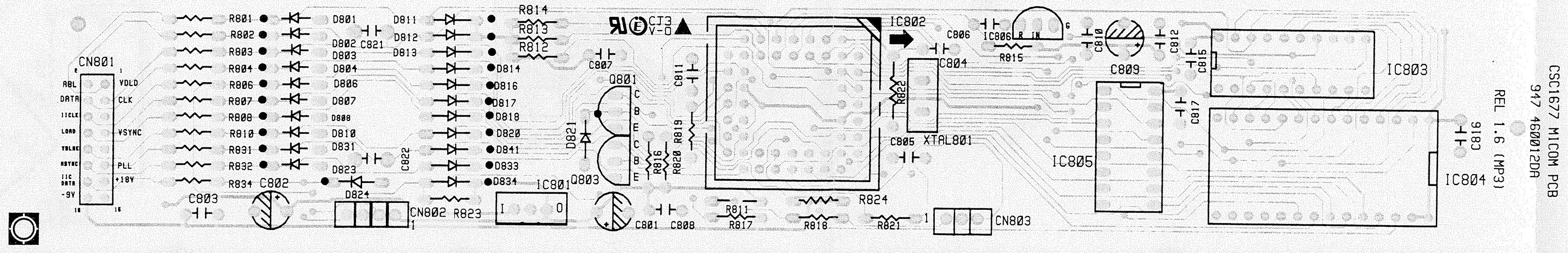

LCD851
IC851
IC852
VR851
GND
CN851
CN852
CN853
CN854
R888
R889
C855
C856
SW851
SW852
SW853
SW854
SW855
SW856
SW857
SW858
SW859
SW860
SW861

(BOTTOM VIEW)

-. u-COM PWB

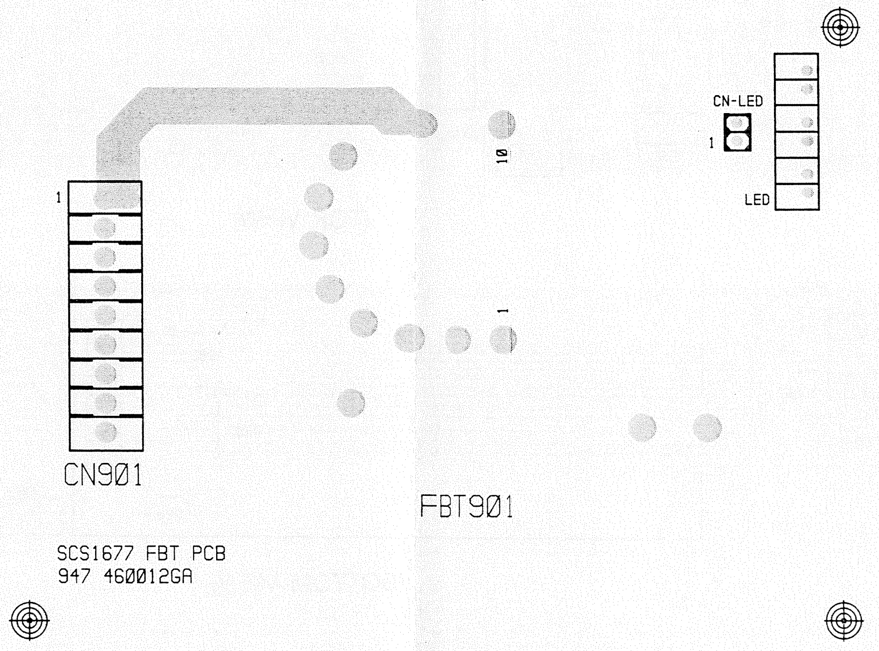

CSC1677 MICOM PCB
947 460012DA
REL 1.6 (MP3)
CN801
CN802
CN803
IC801
IC802
IC803
IC804
IC805
IC806
Q801
Q803
XTAL801
R814
R813
R812
R824
R823
C802
C803
C809
C816

(TOP VIEW)

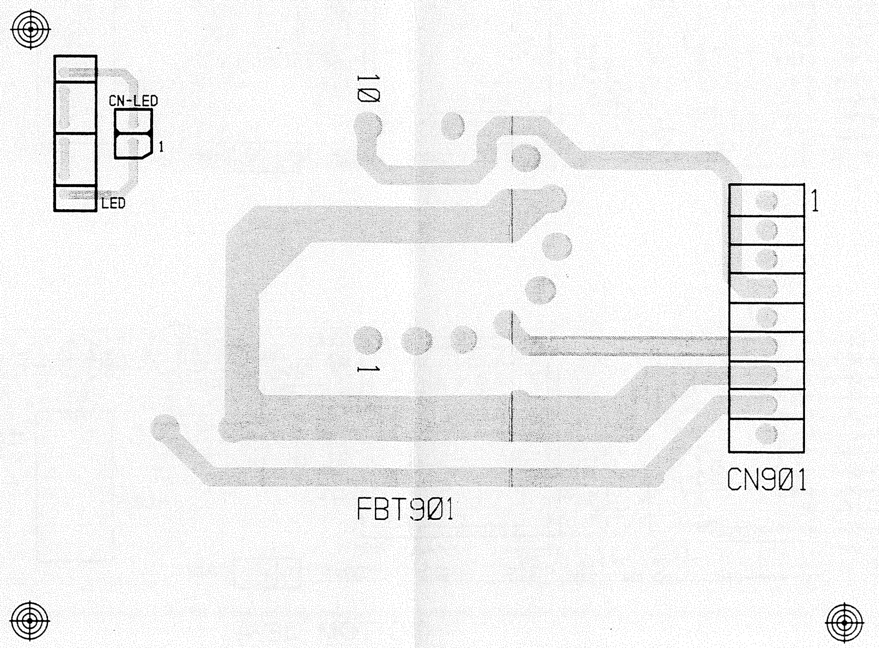

CSC1677 MICOM PCB
947 460012DA
REL 1.6 (MP3)
CN801
CN802
CN803
IC801
IC802
IC803
IC804
IC805
Q801
Q803
XTAL801
R814
R813
R812
R824
R823
C802
C803
C809
C816

(BOTTOM VIEW)

-. FBT PWB

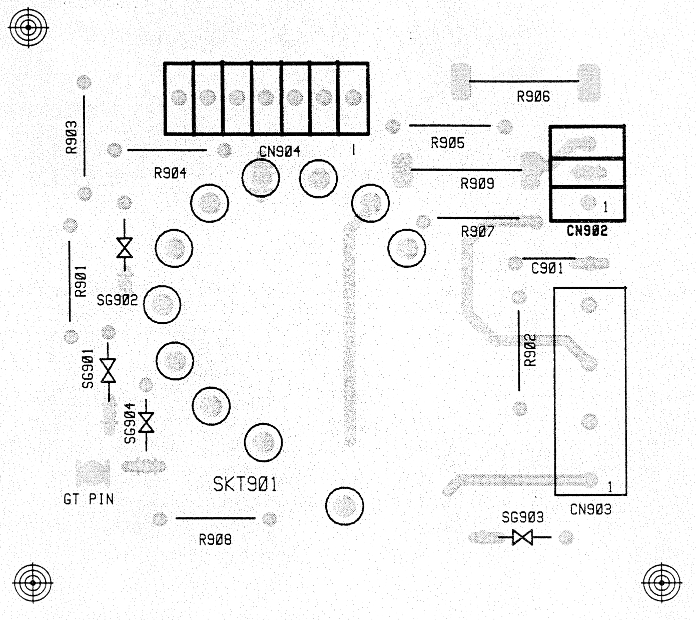

CN-LED
1
LED
1
10
1
CN901
FBT901
SCS1677 FBT PCB
947 460012GA

(TOP VIEW)

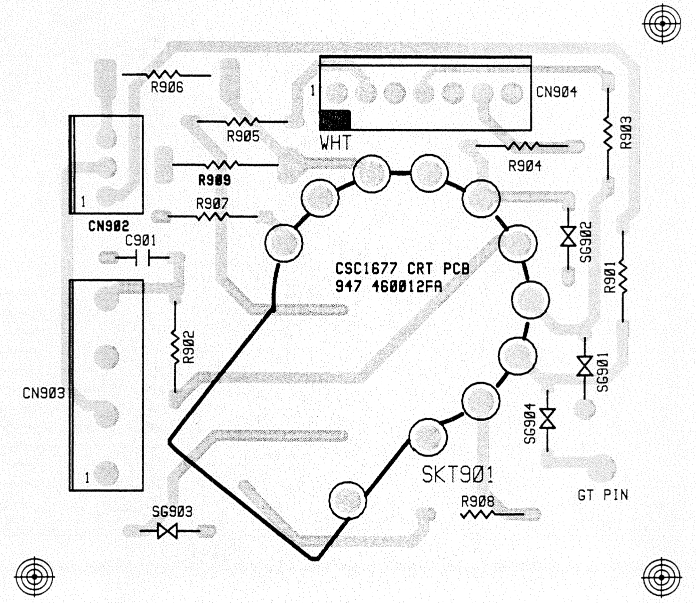

CN-LED
1
LED
10
1
1
FBT901
CN901

(BOTTOM VIEW)

-. CRT PWB

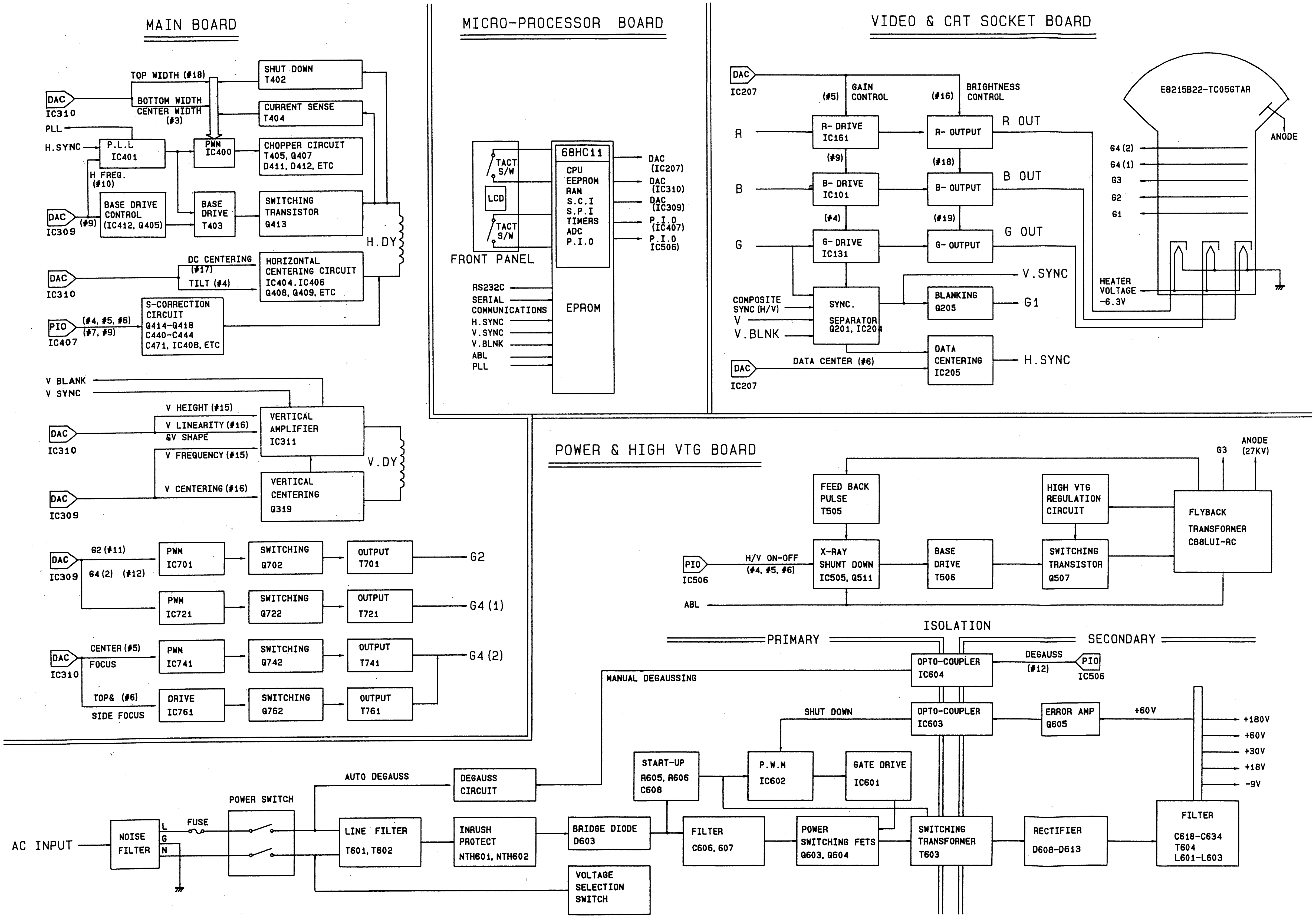

R906
R903
CN904
1
R905
R904
R909
1
R907
CN902
C901
R901
SG902
R902
SG901
SG904
SKT901
1
GT PIN
R908
SG903
CN903

(TOP VIEW)


R906
1
CN904
R905
WHT
R903
R904
R909
R907
1
CN902
C901
SG902
CSC1677 CRT PCB
947 460012FA
R901
R902
CN903
SG901
SG904
1
SKT901
GT PIN
SG903
R908

(BOTTOM VIEW)

BLOCK DIAGRAM

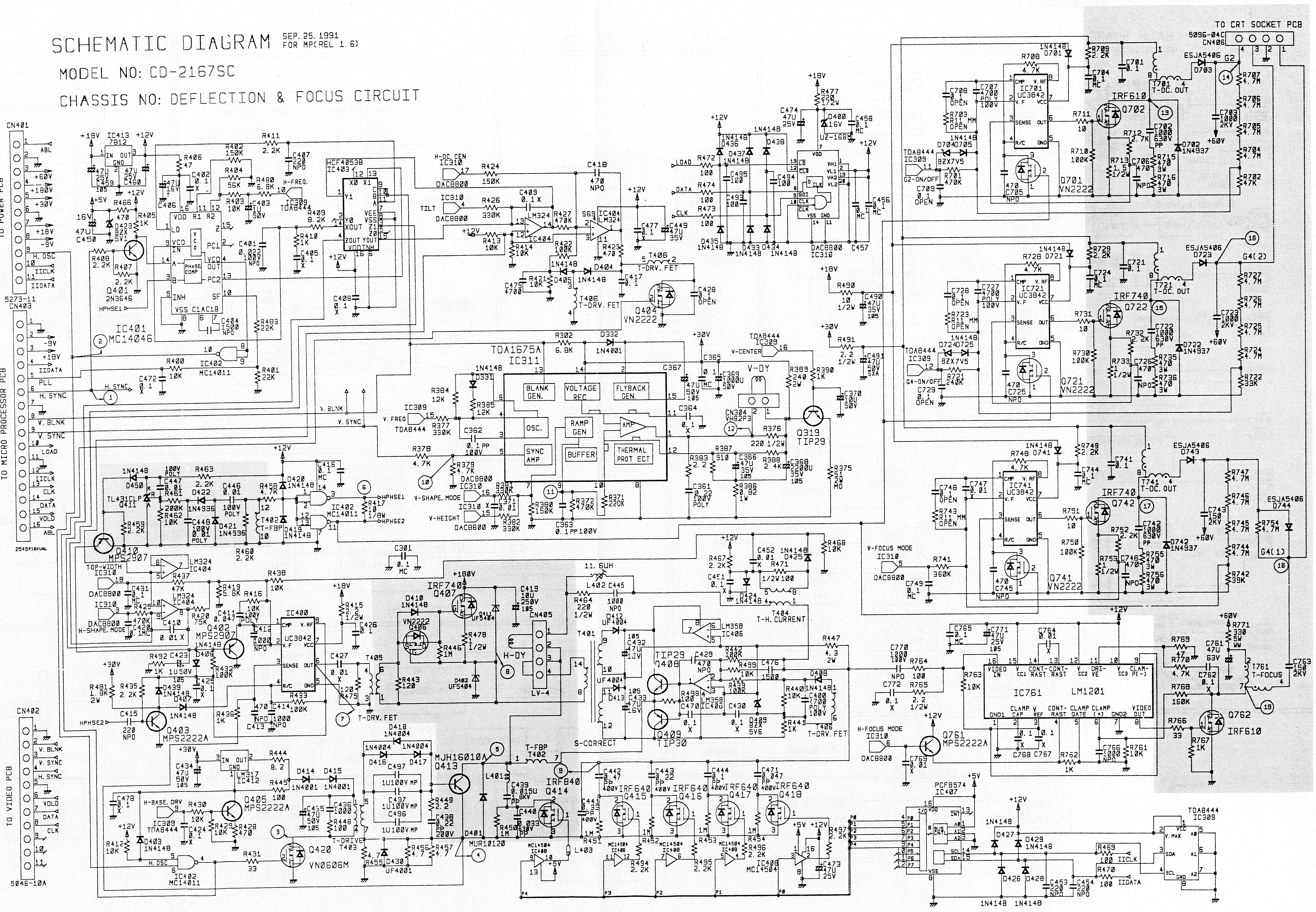

MAIN BOARD
DAC
IC310
TOP WIDTH (#18)
BOTTOM WIDTH
CENTER WIDTH
(#3)
SHUT DOWN
T402
CURRENT SENSE
T404
PLL
H.SYNC
P.L.L
IC401
PWM
IC400
CHOPPER CIRCUIT
T405, Q407
D411, D412, ETC
H FREQ.
(#10)
DAC
IC309
(#9)
BASE DRIVE
CONTROL
(IC412, Q405)
BASE
DRIVE
T403
SWITCHING
TRANSISTOR
Q413
H.DY
DAC
IC310
DC CENTERING
(#17)
TILT (#4)
HORIZONTAL
CENTERING CIRCUIT
IC404.IC406
Q408, Q409, ETC
PIO
IC407
(#4, #5, #6)
(#7, #9)
S-CORRECTION
CIRCUIT
Q414-Q418
C440-C444
C471, IC408, ETC
V BLANK
V SYNC
V HEIGHT (#15)
V LINEARITY (#16)
&V SHAPE
DAC
IC310
VERTICAL
AMPLIFIER
IC311
V FREQUENCY (#15)
V.DY
DAC
IC309
V CENTERING (#16)
VERTICAL
CENTERING
Q319
DAC
IC309
G2 (#11)
G4 (2) (#12)
PWM
IC701
SWITCHING
Q702
OUTPUT
T701
G2
PWM
IC721
SWITCHING
Q722
OUTPUT
T721
G4 (1)
DAC
IC310
CENTER (#5)
FOCUS
PWM
IC741
SWITCHING
Q742
OUTPUT
T741
G4 (2)
TOP& (#6)
SIDE FOCUS
DRIVE
IC761
SWITCHING
Q762
OUTPUT
T761
MICRO-PROCESSOR BOARD
TACT
S/W
LCD
TACT
S/W
FRONT PANEL
68HC11
CPU
EEPROM
RAM
S.C.I
S.P.I
TIMERS
ADC
P.I.O
EPROM
DAC
(IC207)
DAC
(IC310)
DAC
(IC309)
P.I.O
(IC407)
P.I.O
IC506)
RS232C
SERIAL
COMMUNICATIONS
H.SYNC
V.SYNC
V.BLNK
ABL
PLL
VIDEO & CRT SOCKET BOARD
DAC
IC207
(#5)
GAIN
CONTROL
(#16)
BRIGHTNESS
CONTROL
R
R- DRIVE
IC161
R- OUTPUT
R OUT
(#9)
(#18)
B
B- DRIVE
IC101
B- OUTPUT
B OUT
(#4)
(#19)
G
G- DRIVE
IC131
G- OUTPUT
G OUT
V.SYNC
COMPOSITE
SYNC (H/V)
V
V.BLNK
SYNC.
SEPARATOR
Q201, IC204
BLANKING
Q205
G1
DAC
IC207
DATA CENTER (#6)
DATA
CENTERING
IC205
H.SYNC
E8215B22-TC056TAR
ANODE
G4 (2)
G4 (1)
G3
G2
G1
HEATER
VOLTAGE
-6.3V
POWER & HIGH VTG BOARD
G3
ANODE
(27KV)
FEED BACK
PULSE
T505
HIGH VTG
REGULATION
CIRCUIT
FLYBACK
TRANSFORMER
C88LUI-RC
PIO
IC506
H/V ON-OFF
(#4, #5, #6)
X-RAY
SHUNT DOWN
IC505, Q511
BASE
DRIVE
T506
SWITCHING
TRANSISTOR
Q507
ABL
ISOLATION
PRIMARY
SECONDARY
MANUAL DEGAUSSING
OPTO-COUPLER
IC604
DEGAUSS
(#12)
PIO
IC506
SHUT DOWN
OPTO-COUPLER
IC603
ERROR AMP
Q605
+60V
+180V
+60V
+30V
+18V
-9V
START-UP
R605, R606
C608
P.W.M
IC602
GATE DRIVE
IC601
AUTO DEGAUSS
DEGAUSS
CIRCUIT
POWER SWITCH
AC INPUT
NOISE
FILTER
L
G
N
FUSE
LINE FILTER
T601, T602
INRUSH
PROTECT
NTH601, NTH602
BRIDGE DIODE
D603
FILTER
C606, 607
POWER
SWITCHING FETS
Q603, Q604
SWITCHING
TRANSFORMER
T603
RECTIFIER
D608-D613
FILTER
C618-C634
T604
L601-L603
VOLTAGE
SELECTION
SWITCH

SCHEMATIC DIAGRAM

SEP. 25. 1991
FOR MP(REL 1.6)

MODEL NO: CD-2167SC

CHASSIS NO: DEFLECTION & FOCUS CIRCUIT


CN401
TO POWER PCB
ABL
+60V
+180V
+30V
+18V
-9V
H. OSC
IICLK
IIDATA
5273-11
CN403
TO MICRO PROCESSOR PCB
+18V
IIDATA
PLL
H. SYNC
V. BLNK
V. SYNC
LOAD
IICLK
CLK
DATA
VDLD
ABL
CN402
TO VIDEO PCB
V. BLNK
V. SYNC
H. SYNC
VDLD
DATA
CLK
5046-10A
IC413 7812
IC401 MC14046
PHASE COMP
VCO
HCF4053B IC403
Q401 2N3646
IC402 MC14011
H-FREQ.
TDA8444
H-DC. CEN IC310
DAC8800
TILT
IC404 LM324
Q404 VN2222
T406 T-DRV. FET
TDA1675A IC311
BLANK GEN.
VOLTAGE REG
FLYBACK GEN.
OSC.
RAMP GEN
AMP
SYNC AMP
BUFFER
THERMAL PROT ECT
V. FREQ
V-SHAPE. MODE
V-HEIGHT
V-CENTER
V-DY
CN304 VH82P3
Q319 TIP29
Q410 MPS2907
TL431CLP Q411
TOP-WIDTH IC310
H-SHAPE. MODE
IC400 UC3842
Q402 MPS2907
IRF740 Q407
Q406 VN2222
H-DY
CN405
LV-4
T405 T-DRV. FET
Q403 MPS2222A
HPHSE1
HPHSE2
IC412 LM317
Q405 MPS2222A
H-BASE. DRV
IC309 TDA8444
Q420 VN0606M
T403 T-DRIVE
MJH16010A Q413
MUR10120
T-FBP T402
IRF840 Q414
IRF640 Q415
IRF640 Q416
IRF640 Q417
IRF640 Q418
MC14584 IC408
T401
S-CORRECT
TIP29 Q408
TIP30 Q409
LM358 IC406
T404 T-H. CURRENT
T408 T-DRV. FET
L402 11. 6UH
V-FOCUS MODE IC310
H-FOCUS MODE IC310
Q761 MPS2222A
IC761 LM1201
VIDEO IN
V CC1
CONT-RAST
CONT-RAST
V CC2
DRI-VE
V CC3
CLAM-P(-)
GND1
CLAMP CAP
V REF
CONT-RAST
CLAMP GATE (+)
GND2
VIDEO OUT
T761 T-FOCUS
Q762 IRF610
PCF8574 IC407
TDA8444 IC309
TO CRT SOCKET PCB
5096-04C CN406
G2
G4(2)
G4(1)
IC701 UC3842
IRF610 Q702
Q701 VN2222
T701 T-DC. OUT
G2-ON/OFF
IC721 UC3842
IRF740 Q722
Q721 VN2222
T721 T-DC. OUT
G4-ON/OFF
IC741 UC3842
IRF740 Q742
Q741 VN2222
T741 T-DC. OUT
ESJA5406

SCHEMATIC DIAGRAM SEP 25,1991 FOR MP(REL 1.6)

MODEL NO: CD-2167SC

CHASSIS NO: SC-POWER&HIGHVOLT

WARNING: BEFORE SERVICING THIS CHASSIS, READ 'X-RAY RADIATION PRECAUTION, SAFETY PRECAUTION, PRODUCT SAFETY NOTICE'.

CAUTION

1. THE SHADED AREAS AND⚠ MARKS IN THE SCHEMATIC DIAGRAM AND THE PARTS LIST DESIGNATE COMPONENTS WHICH HAVE SPECIAL CHARACTERISTICS IMPORTANT FOR SAFETY AND SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT OR SPECIFIED IN THE PARTS LIST. BEFORE REPLACING ANY OF THIS COMPONENTS, READ CAREFULLY THE 'PRODUCT SAFETY NOTICE'.
2. DURING A NUMEROUS MEASUREMENT OF THIS MONITOR MATTERS THAT DEMAND SPECIAL ATTENTION IS FOLLOWING
   1) DO NOT USE YOUR INSTRUMENT BETWEEN PRIMARY GROUND (SYMBOL ⏚) AND SECONDARY CIRCUIT.
   2) DO NOT USE YOUR INSTRUMENT BETWEEN SECONDARY GROUND (SYMBOL ⏚) AND PRIMARY CIRCUIT.
3. THE SHADED AREAS ARE PRIMARY SECTION(HOT PART).

WARNING: 'THIS EQUIPMENT CONTAINS SAFETY CRITICAL COMPONENTS ALL PARTS SHOWN IN THE SHADED AREAS OF THE SCHEMATIC ARE SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURERS RECOMMANDED PARTS LIST FOR EXACT REPLACEMENTS.'

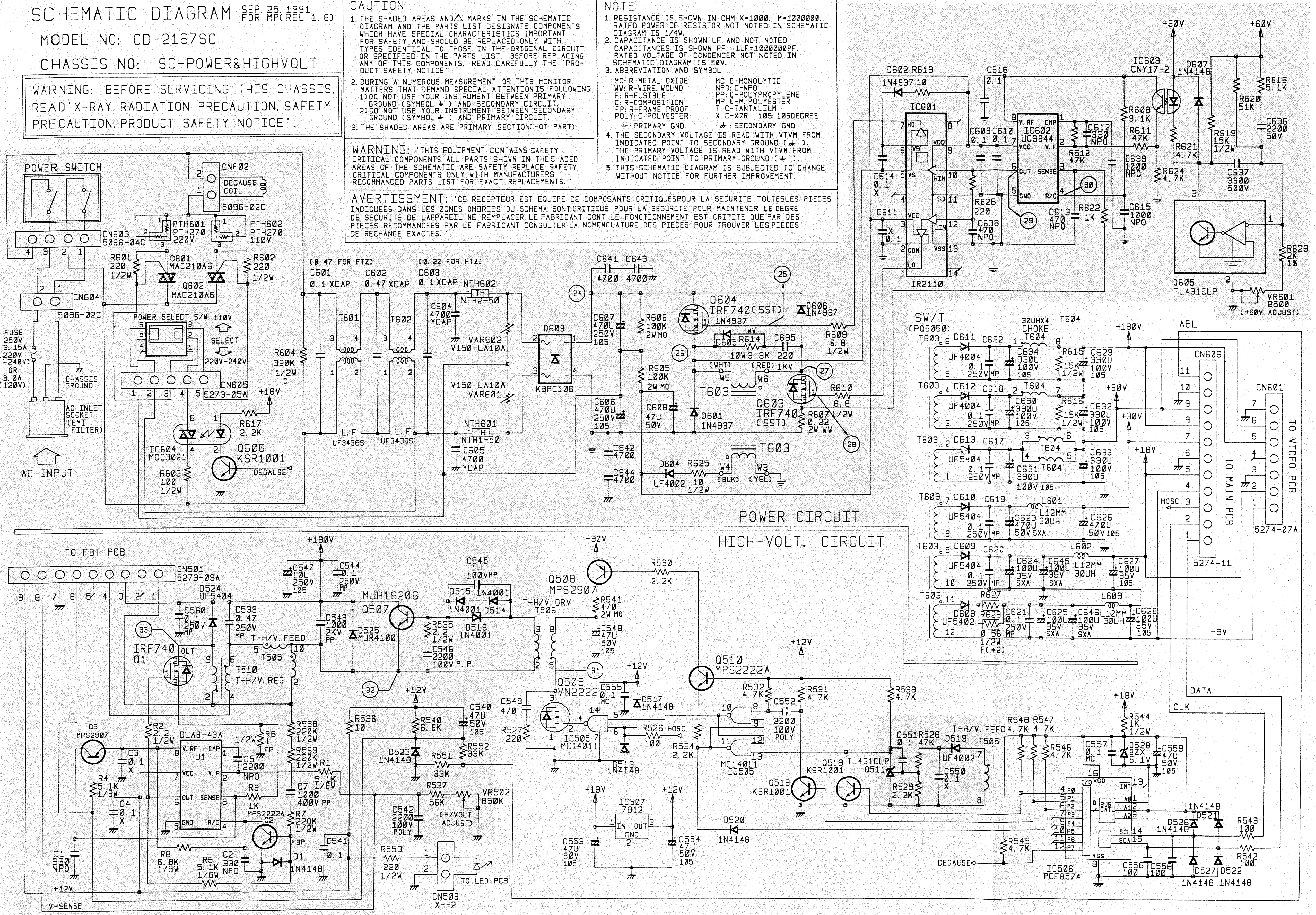
NOTE

1. RESISTANCE IS SHOWN IN OHM K=1000. M=1000000. RATED POWER OF RESISTOR NOT NOTED IN SCHEMATIC DIAGRAM IS 1/4W.
2. CAPACITANCE IS SHOWN UF AND NOT NOTED CAPACITANCES IS SHOWN PF. 1UF=1000000PF. RATED VOLTAGE OF CONDENCER NOT NOTED IN SCHEMATIC DIAGRAM IS 50V.
3. ABBREVIATION AND SYMBOL

MO: R-METAL OXIDE	MC: C-MONOLYTIC
WW: R-WIRE. WOUND	NPO: C-NPO
F: R-FUSIBLE	PP: C-POLYPROPYLENE
C: R-COMPOSITION	MP: C-M. POLYESTER
FP: R-FRAME PROOF	T: C-TANTALIUM
POLY: C-POLYESTER	X: C-X7R 105: 105DEGREE
⏚: PRIMARY GND	⏚: SECONDARY GND

4. THE SECONDARY VOLTAGE IS READ WITH VTVM FROM INDICATED POINT TO SECONDARY GROUND (⏚). THE PRIMARY VOLTAGE IS READ WITH VTVM FROM INDICATED POINT TO PRIMARY GROUND (⏚).
5. THIS SCHEMATIC DIAGRAM IS SUBJECTED TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT.

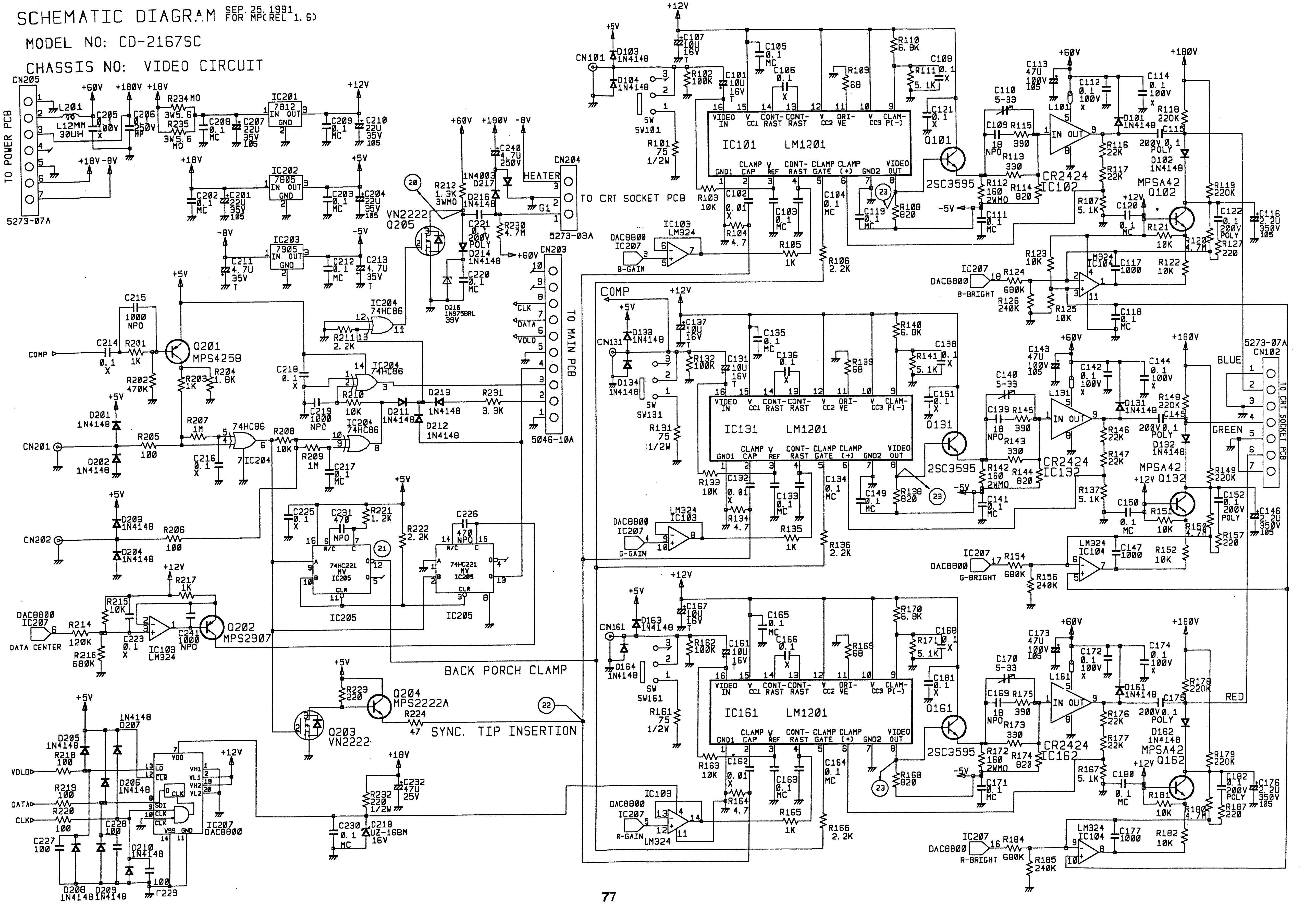
AVERTISSMENT: 'CE RECEPTEUR EST EQUIPE DE COMPOSANTS CRITIQUESPOUR LA SECURITE TOUTESLES PIECES INDIQUEES DANS LES ZONES OMBREES DU SCHEMA SONT CRITIQUE POUR LA SECURITE POUR MAINTENIR LE DEGRE DE SECURITE DE LAPPAREIL NE REMPLACER LE FABRICANT DONT LE FONCTIONNEMENT EST CRITITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT CONSULTER LA NOMENCLATURE DES PIECES POUR TROUVER LES PIECES DE RECHANGE EXACTES.'


POWER CIRCUIT
HIGH-VOLT. CIRCUIT
POWER SWITCH
CNF02
DEGAUSE COIL
5096-02C
CN603 5096-04C
PTH601 PTH270 220V
PTH602 PTH270 110V
R601 220 1/2W
Q601 MAC210A6
Q602 MAC210A6
R602 220 1/2W
CN604
5096-02C
FUSE 250V 3.15A (220V -240V) OR 3.0A (120V)
CHASSIS GROUND
AC INLET SOCKET (EMI FILTER)
AC INPUT
POWER SELECT S/W 110V
SELECT 220V-240V
CN605 5273-05A
+18V
R617 2.2K
IC604 MOC3021
R603 100 1/2W
Q606 KSR1001
DEGAUSE
R604 330K 1/2W C
(0.47 FOR FTZ)
C601 0.1 XCAP
C602 0.47 XCAP
(0.22 FOR FTZ)
C603 0.1 XCAP
T601
T602
L.F UF3438S
L.F UF3438S
NTH602 TH NTH2-50
C604 4700 YCAP
VAR602 V150-LA10A
V150-LA10A VAR601
NTH601 TH NTH1-50
C605 4700 YCAP
D603
KBPC106
C641 C643 4700 4700
24
25
26
27
28
C607 470U 250V 105
C606 470U 250V 105
R606 100K 2W MO
R605 100K 2W MO
C608 47U 50V
D601 1N4937
C642 4700
C644 4700
Q604 IRF740(SST)
1N4937
D606 1N4937
D605 R614 10W3.3K
C635 220 1KV
(WHT) (RED)
W5 W6
T603
Q603 IRF740 (SST)
R610 6.8
R609 6.8 1/2W
R607 1/2W 0.22 2W WW
D604 R625 UF4002 10 1/2W
W4 W3 (BLK) (YEL)
D602 R613 1N4937 10
C616 0.1
IC601
IR2110
C614 0.1 X
C611 X 0.1
HO VDD VB VS HIN SD VCC LIN COM VSS LO
C609 C610 0.1 0.1
IC602 UC3844
V.RF CMP VCC V.F OUT SENSE GND R/C
C612 330 NPO
R612 47K
R626 220
C638 470 NPO
C613 470 NPO
R622 1K
29
30
IC603 CNY17-2
D607 1N4148
+30V
+60V
R608 9.1K
R611 47K
C639 1000 NPO
C615 1000 NPO
R624 4.7K
R621 4.7K
R619 15K 1/2W
R620 51K
R618 5.1K
C636 2200 50V
C637 3300 500V
R623 2K 1%
Q605 TL431CLP
VR601 850Ω (+60V ADJUST)
SW/T (PO5050)
30UHX4 CHOKE T604
+180V
ABL
T603 D611 C622 UF4004 0.1 250V MP
C634 330U 100V 105
R615 15K 1/2W
C629 330U 100V 105
D612 C618 UF4004 0.1 250V MP
C630 330U 100V 105
R616 15K 1/2W
C632 330U 100V 105
+60V
+30V
D613 C617 UF5404 0.1 250V MP
C631 330U 100V 105
C633 330U 100V 105
+18V
D610 C619 UF5404 0.1 250V MP
L601 L12MM 30UH
C623 470U 50V SXA
C626 470U 50V 105
HOSC
D609 C620 UF5404 0.1 250V MP
C624 100U 35V SXA
C645 100U 35V SXA
L602 L12MM 30UH
C627 100U 35V 105
R627
L603
D608 R628 UF5402 0.56 1/2W F(*2)
C621 0.1 250V MP
C625 100U 35V SXA
C646 100U 35V SXA
L12MM 30UH
C628 100U 35V 105
-9V
CN606
TO MAIN PCB
5274-11
CN601
TO VIDEO PCB
5274-07A
DATA
CLK
TO FBT PCB
CN501 5273-09A
V-SENSE
+12V
+180V
C547 10U 250V 105
C544 0.1 250V MP
D524 UF5404
C560 0.1 250V MP
C539 0.47 250V MP
33
IRF740 Q1
T-H/V. FEED
T505
T510 T-H/V. REG
C543 1000 2KV PP
D525 MUR4100
MJH16206 Q507
C545 1U 100V MP
D515 1N4001
1N4001 D514
D516 1N4001
R535 2.2 1/2W
C546 2200 100V P.P
32
T-H/V. DRV T506
+30V
Q508 MPS2907
R530 2.2K
R541 470 2W MO
C548 47U 50V 105
31
Q509 VN2222
C555 0.1 MC
D517 1N4148
C549 470
R527 220
IC505 MC14011
D518 1N4148
R526 100
R534 2.2K
Q510 MPS2222A
R532 4.7K
C552 2200 100V POLY
R531 4.7K
R533 4.7K
MC14011 IC505
Q3 MPS2907
R2 2.2 1/2W
DLA8-43A U1
C3 0.1 X
R4 5.1K 1/8W
C4 0.1 X
C5 2200 NPO
R6 1/2W FP
R3 1K
MPS2222A Q2
R8 6.8K 1/8W
R5 5.1K 1/8W
C2 330 NPO
D1 1N4148
C1 330 NPO
R538 220K 1/2W
R539 220K 1/2W
R1 5.1K 1/8W
C7 1000 400V PP
R7 220K 1/2W
FBP
C541 0.1
R536 10
+12V
R540 6.8K
C540 47U 50V 105
R552 33K
D523 1N4148
R551 33K
R537 56K
VR502 850K
C542 2200 100V POLY
(H/VOLT. ADJUST)
R553 220 1/2W
CN503 XH-2
TO LED PCB
+18V
IC507 7812
IN OUT GND
+12V
C553 47U 50V 105
C554 47U 50V 105
D520 1N4148
Q518 KSR1001
Q519 KSR1001
TL431CLP Q511
C551 R528 0.1 47K
R529 2.2K
C550 0.1 X
T-H/V. FEED
D519 UF4002
T505
R548 R547 4.7K 4.7K
R546 4.7K
C557 0.1 MC
D528 RZX 5.1V
C559 47U 50V 105
R544 1K 1/2W
1N4148 D521
D526 1N4148
R543 100
R542 100
R545 4.7K
DEGAUSE
IC506 PCF8574
C556 100
C558 100
D527 D522 1N4148 1N4148

SCHEMATIC DIAGRAM SEP. 25. 1991 FOR MP(REL 1.6)

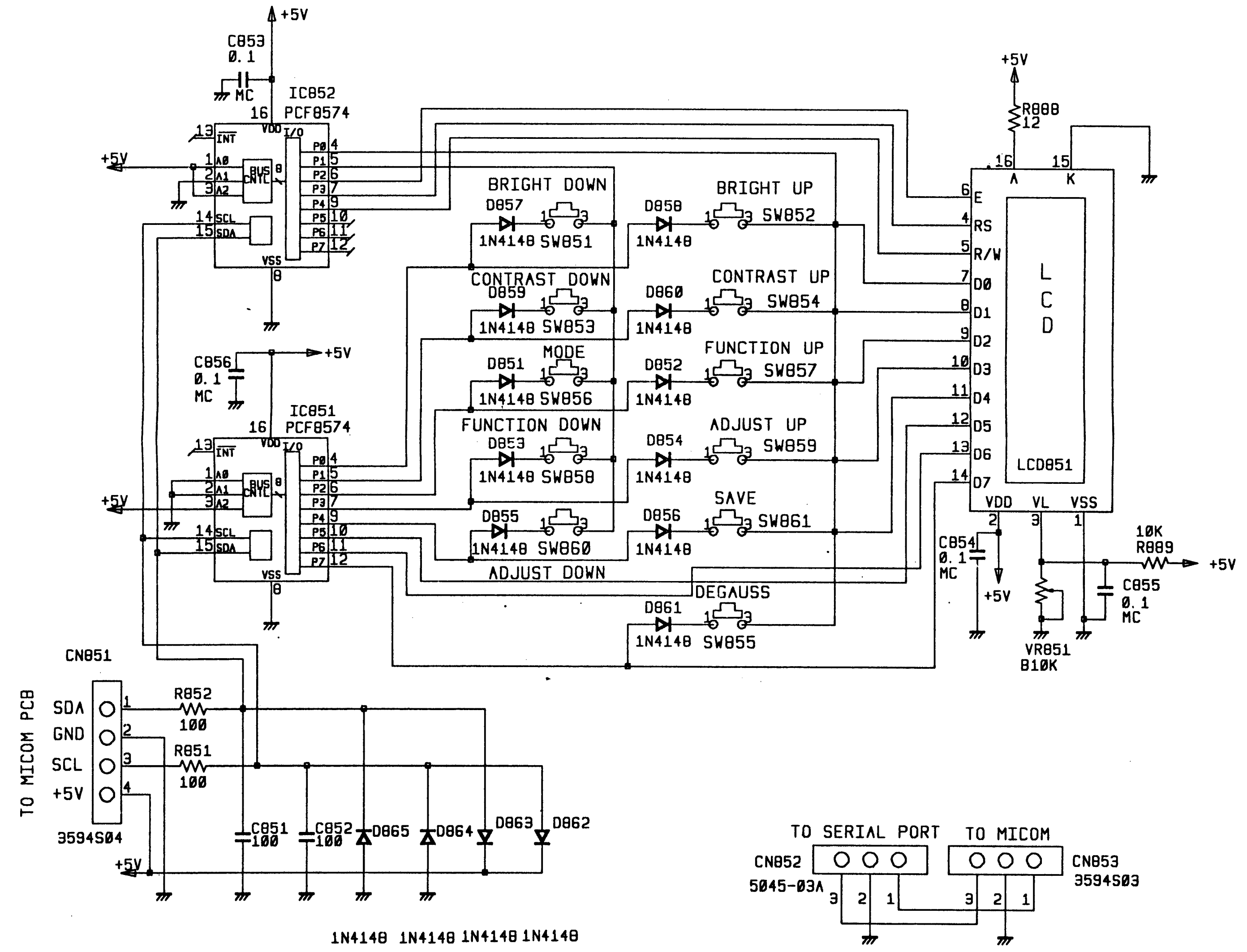
MODEL NO: CD-2167SC

CHASSIS NO: VIDEO CIRCUIT

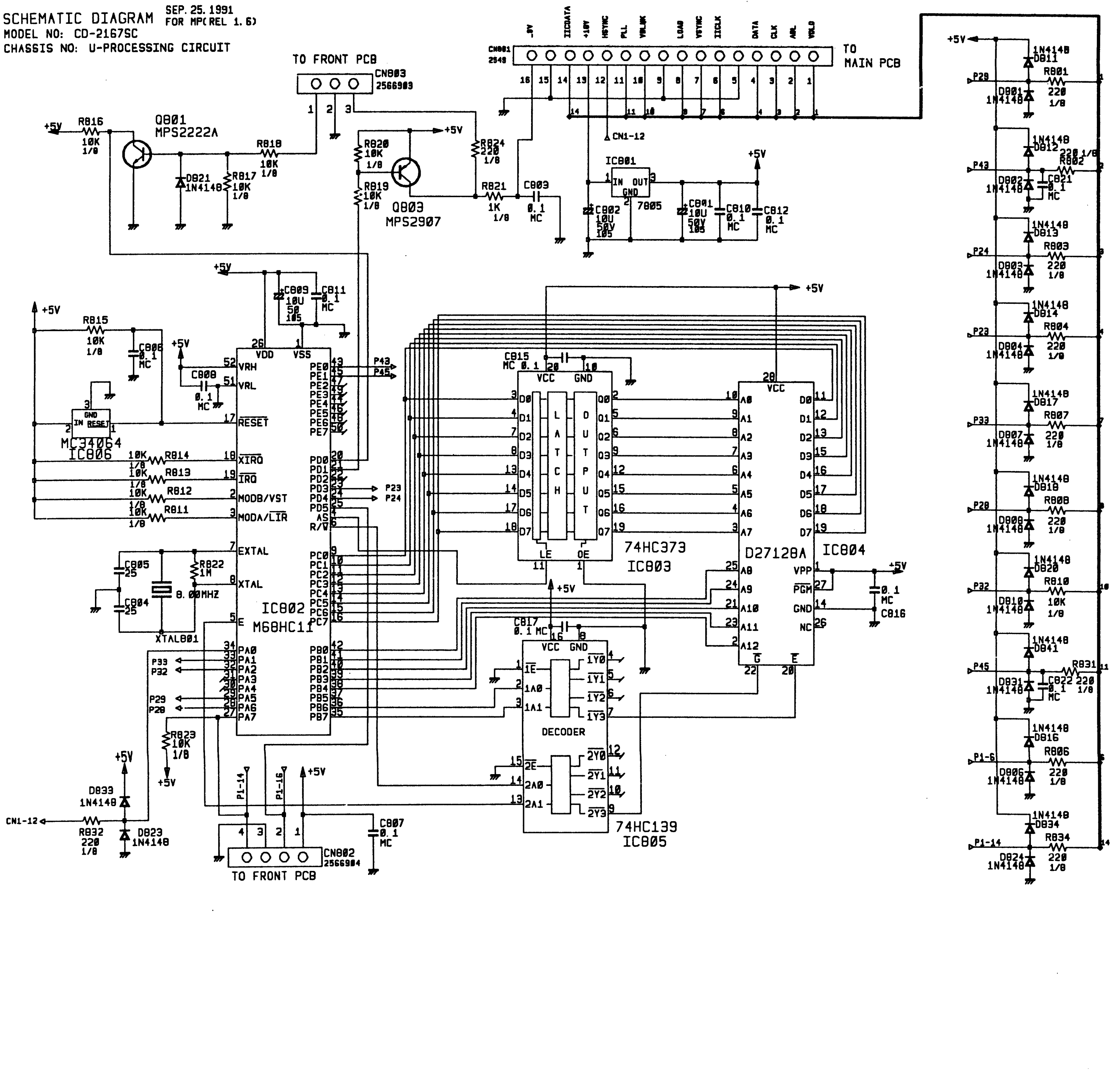


TO POWER PCB
CN205
5273-07A
L201
L12MN 30UH
C205 0.1 100V X
C206 0.1 250V MP
+60V
+180V
+18V
R234 MO
R235 3W5.6 MO
IC201 7812
IN OUT GND
C208 0.1 MC
C207 22U 35V 105
C209 0.1 MC
C210 22U 35V 105
+12V
+18V-8V
+18V
IC202 7805
C202 0.1 MC
C201 22U 35V 105
C203 0.1 MC
C204 22U 35V 105
+5V
-8V
IC203 7905
C211 4.7U 35V T
C212 0.1 MC
C213 4.7U 35V T
-5V
+60V
+180V
-8V
R212 1.3K 3WMO
1N4003 D217
D216 1N4148
C240 4.7U 250V
HEATER
CN204
G1
5273-03A
TO CRT SOCKET PCB
VN2222 Q205
C221 0.1 200V POLY
R230 4.7M
D214 1N4148
C220 0.1 MC
D215 1N5975BRL 39V
+60V
CN203
CLK
DATA
VDLD
TO MAIN PCB
5046-10A
C215 1000 NPO
COMP
C214 0.1 X
R201 1K
Q201 MPS4258
R202 470K
R203 1K
R204 1.8K
+5V
IC204 74HC86
R211 2.2K
C218 0.1 X
R210 10K
C219 1000 NPO
D211 1N4148
D213 1N4148
D212 1N4148
R231 3.3K
D201 1N4148
CN201
D202 1N4148
R205 100
R207 1M
C216 0.1 X
R208 10K
R209 1M
C217 0.1 MC
+5V
C225 0.1 X
C231 470 NPO
R221 1.2K
R222 2.2K
C226 470 NPO
74HC221 MV IC205
R/C
CLR
D203 1N4148
CN202
R206 100
D204 1N4148
+12V
R217 1K
R215 10K
DAC8800 IC207
DATA CENTER
R214 120K
R216 680K
C223 0.1 X
IC103 LM324
C241 1000 NPO
Q202 MPS2907
BACK PORCH CLAMP
+5V
R223 220
Q204 MPS2222A
R224 47
Q203 VN2222
SYNC. TIP INSERTION
D205 1N4148
D207 1N4148
R218 100
VDLD
D206 1N4148
R219 100
DATA
R220 100
CLK
C227 100
C228 100
D210 1N4148
D208 1N4148
D209 1N4148
C229 100
IC207 DAC8800
+12V
+18V
R232 220 1/2W
C232 47U 25V
C230 0.1 MC
D218 UZ-16BM 16V
+12V
+5V
CN101
D103 1N4148
D104 1N4148
C107 10U 16V T
R102 100K
C101 10U 16V T
SW SW101
R101 75 1/2W
C105 0.1 MC
C106 0.1 X
R109 68
R110 6.8K
R111 5.1K
C108 0.1 X
IC101 LM1201
VIDEO IN
V CC1
CONT-RAST
CONT-RAST
V CC2
DRI-VE
V CC3
CLAM-P(-)
GND1
CLAMP CAP
V REF
CONT-RAST
CLAMP GATE
CLAMP (+)
GND2
VIDEO OUT
C121 0.1 X
Q101 2SC3595
R103 10K
C102 0.01 X
C103 0.1 MC
C104 0.1 MC
C119 0.1 MC
R108 820
R104 4.7
R105 1K
R106 2.2K
DAC8800 IC207
B-GAIN
IC103 LM324
C113 47U 100V 105
+60V
C110 5-33
C109 18 NPO
R115 390
R113 330
L101
CR2424 IC102
IN OUT
C112 0.1 100V X
D101 1N4148
C114 0.1 100V X
+180V
R118 220K
C115 200V 0.1 POLY
D102 1N4148
R116 22K
R117 22K
MPSA42 Q102
R112 160 2WMO
R114 820
-5V
C111 0.1 MC
R107 5.1K
C120 0.1 MC
+12V
R121 10K
R119 220K
C122 0.1 200V POLY
C116 2.2U 350V 105
R120 4.7M
R127 220
R123 10K
IC104 LM324
C117 1000
R122 10K
DAC8800 IC207
B-BRIGHT
R124 680K
R126 240K
R125 10K
C118 0.1 MC
COMP
+12V
+5V
CN131
D133 1N4148
D134 1N4148
C137 10U 16V T
R132 100K
C131 10U 16V T
SW SW131
R131 75 1/2W
C135 0.1 MC
C136 0.1 X
R139 68
R140 6.8K
R141 5.1K
C138 0.1 X
IC131 LM1201
C151 0.1 X
Q131 2SC3595
R133 10K
C132 0.01 X
C133 0.1 MC
C134 0.1 MC
C149 0.1 MC
R138 820
R134 4.7
R135 1K
R136 2.2K
DAC8800 IC207
G-GAIN
LM324 IC103
C143 47U 100V 105
C140 5-33
C139 18 NPO
R145 390
R143 330
L131
CR2424 IC132
C142 0.1 100V X
D131 1N4148
C144 0.1 100V X
R148 220K
C145 200V 0.1 POLY
D132 1N4148
R146 22K
R147 22K
MPSA42 Q132
R142 160 2WMO
R144 820
C141 0.1 MC
R137 5.1K
C150 0.1 MC
R151 10K
R149 220K
C152 0.1 200V POLY
C146 2.2U 350V 105
R150 4.7M
R157 220
LM324 IC104
C147 1000
R152 10K
DAC8800 IC207
G-BRIGHT
R154 680K
R156 240K
5273-07A CN102
BLUE
GREEN
RED
TO CRT SOCKET PCB
+12V
+5V
CN161
D163 1N4148
D164 1N4148
C167 10U 16V T
R162 100K
C161 10U 16V T
SW SW161
R161 75 1/2W
C165 0.1 MC
C166 0.1 X
R169 68
R170 6.8K
R171 5.1K
C168 0.1 X
IC161 LM1201
C181 0.1 X
Q161 2SC3595
R163 10K
C162 0.01 X
C163 0.1 MC
C164 0.1 MC
R168 820
R164 4.7
R165 1K
R166 2.2K
IC103
DAC8800 IC207
R-GAIN
LM324
C173 47U 100V 105
C170 5-33
C169 18 NPO
R175 390
R173 330
L161
CR2424 IC162
C172 0.1 100V X
D161 1N4148
C174 0.1 100V X
R178 220K
C175 200V 0.1 POLY
D162 1N4148
R176 22K
R177 22K
MPSA42 Q162
R172 160 2WMO
R174 820
C171 0.1 MC
R167 5.1K
C180 0.1 MC
R181 10K
R179 220K
C182 0.1 200V POLY
C176 2.2U 350V 105
R180 4.7M
R187 220
LM324 IC104
C177 1000
R182 10K
DAC8800 IC207
R-BRIGHT
R184 680K
R185 240K

SCHEMATIC DIAGRAM SEP. 25. 1991 FOR MP(REL 1. 6)
MODEL NO: CD-2167SC
CHASSIS NO: FRONT CONTROL CIRCUIT

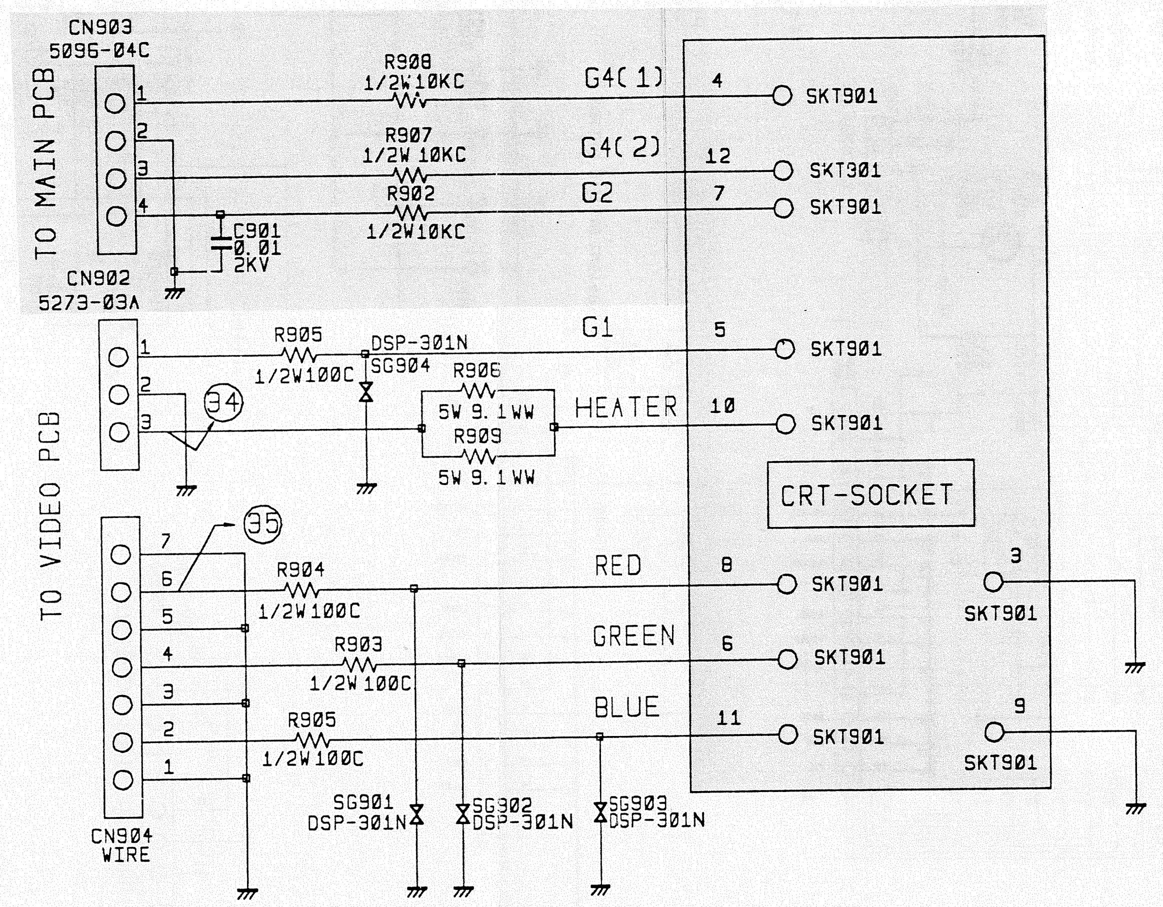

IC852 PCF8574
C853 0.1 MC
IC851 PCF8574
C856 0.1 MC
BRIGHT DOWN
D857 1N4148 SW851
BRIGHT UP
D858 1N4148 SW852
CONTRAST DOWN
D859 1N4148 SW853
CONTRAST UP
D860 1N4148 SW854
MODE
D851 1N4148 SW856
FUNCTION UP
D852 1N4148 SW857
FUNCTION DOWN
D853 1N4148 SW858
ADJUST UP
D854 1N4148 SW859
SAVE
D855 1N4148 SW860
D856 1N4148 SW861
ADJUST DOWN
DEGAUSS
D861 1N4148 SW855
LCD LCD851
R888 12
R889 10K
C854 0.1 MC
C855 0.1 MC
VR851 B10K
CN851
TO MICOM PCB
SDA GND SCL +5V
3594S04
R852 100
R851 100
C851 100
C852 100
D865 D864 D863 D862
1N4148 1N4148 1N4148 1N4148
TO SERIAL PORT
CN852 5045-03A
TO MICOM
CN853 3594S03

SCHEMATIC DIAGRAM SEP. 25. 1991 FOR MP(REL 1. 6)
MODEL NO: CD-2167SC
CHASSIS NO: U-PROCESSING CIRCUIT

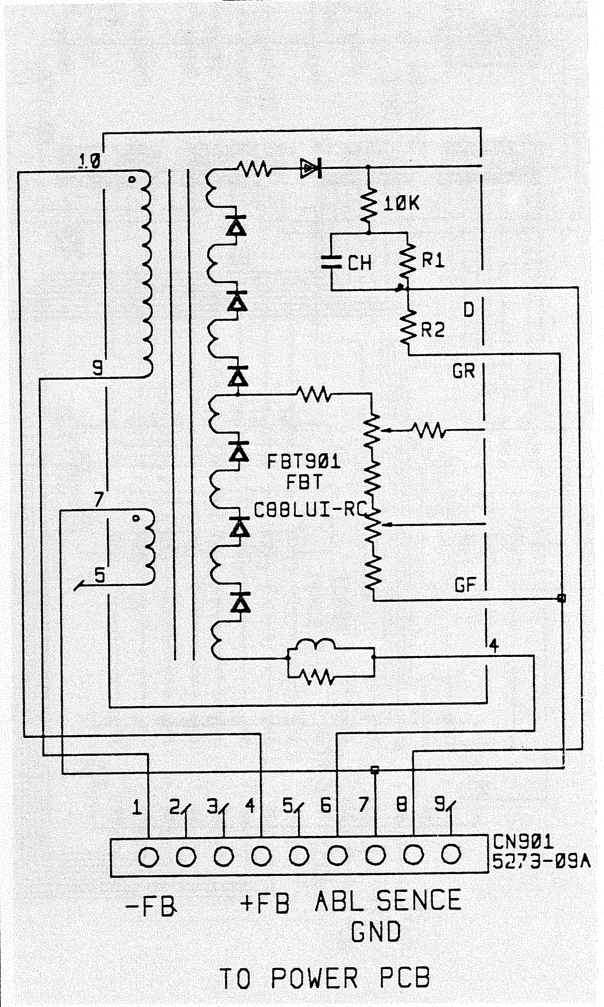

TO FRONT PCB
CN803 2566S03
TO MAIN PCB
CN801
5V IICDATA +18V HSYNC PLL VBLNK LOAD VSYNC IICLK DATA CLK ABL VBLO
Q801 MPS2222A
R816 10K 1/8
R818 10K 1/8
R817 10K 1/8
D821 1N4148
Q803 MPS2907
R820 10K
R819 10K 1/8
R824 220 1/8
R821 1K 1/8
C803 0.1 MC
IC801 7805
C802 10U 50V 105
C801 10U 50V 105
C810 0.1 MC
C812 0.1 MC
CN1-12
IC806 MC34064
R815 10K 1/8
C806 0.1 MC
C808 0.1 MC
C809 10U 50 105
C811 0.1 MC
R814 R813 R812 R811 10K 1/8
IC802 M68HC11
XTAL801 8.00MHZ
R822 1M
C805 25
C804 25
R823 10K 1/8
D833 1N4148
D823 1N4148
R832 220 1/8
CN802 2566S04
TO FRONT PCB
C807 0.1 MC
74HC373 IC803
C815 0.1 MC
D27128A IC804
C816 0.1 MC
74HC139 IC805
DECODER
C817 0.1 MC
P43 P45 P23 P24 P33 P32 P29 P20 P1-14 P1-16
D811 D812 D813 D814 D817 D818 D820 D841 D816 D834 1N4148
D801 D802 D803 D804 D807 D808 D810 D831 D806 D824 1N4148
R801 R802 R803 R804 R807 R808 R810 R831 R806 R834
C821 0.1 MC
C822 0.1 MC

SCHEMATIC DIAGRAM SEP. 25. 1991
FOR MP(REL 1. 6)
MODEL NO: CD-2167SC
CHASSIS NO: CRT SOCKET&FBT

CRT SOCKET CIRCUIT

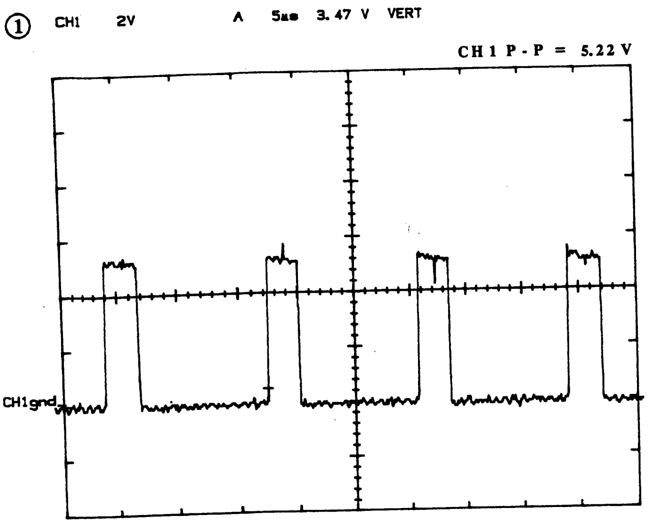

CN903
5096-04C
TO MAIN PCB
R908
1/2W10KC
G4(1)
4
SKT901
R907
1/2W 10KC
G4(2)
12
SKT301
R902
1/2W10KC
G2
7
SKT901
C901
0.01
2KV
CN902
5273-03A
R905
1/2W100C
DSP-301N
SG904
G1
5
SKT901
R906
5W 9.1WW
R909
5W 9.1WW
HEATER
10
SKT901
34
CRT-SOCKET
TO VIDEO PCB
35
R904
1/2W100C
RED
8
SKT901
3
SKT901
R903
1/2W 100C
GREEN
6
SKT901
R905
1/2W100C
BLUE
11
SKT901
9
SKT901
1
2
3
4
5
6
7
CN904
WIRE
SG901
DSP-301N
SG902
DSP-301N
SG903
DSP-301N

FBT CIRCUIT


10
9
7
5
10K
CH
R1
R2
D
GR
FBT901
FBT
C88LUI-RC
GF
4
1
2
3
4
5
6
7
8
9
CN901
5273-09A
-FB
+FB
ABL SENCE
GND
TO POWER PCB

WAVE FORM

①



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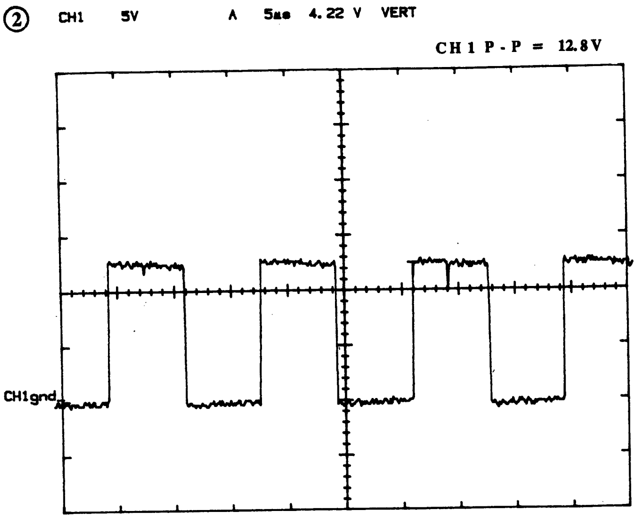

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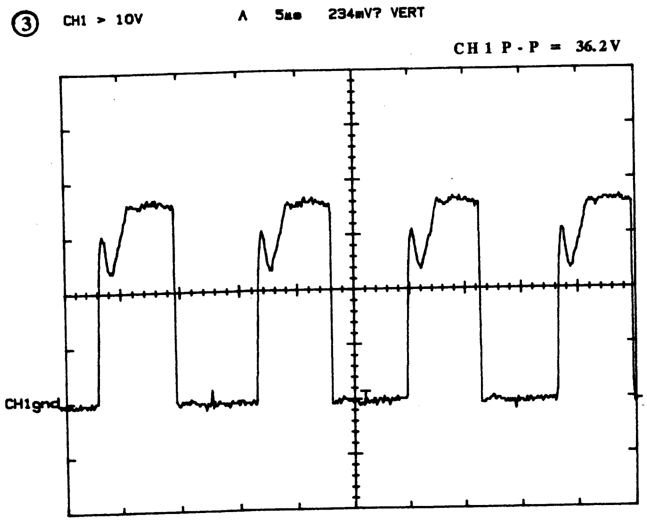

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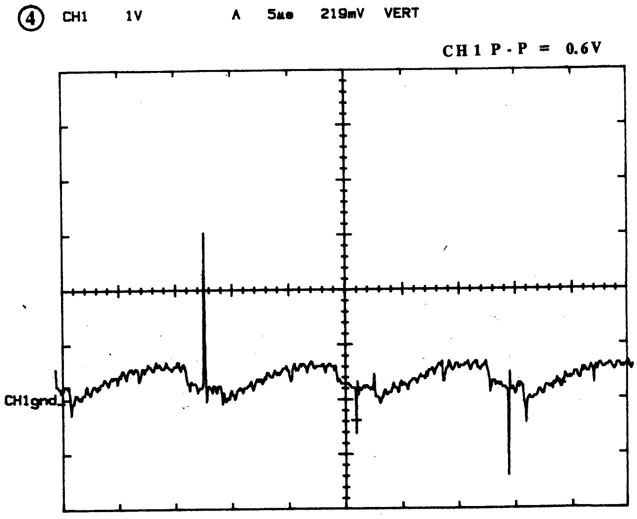

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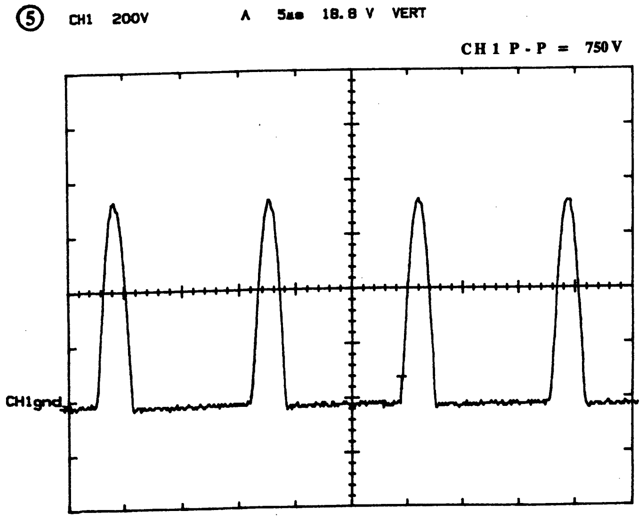

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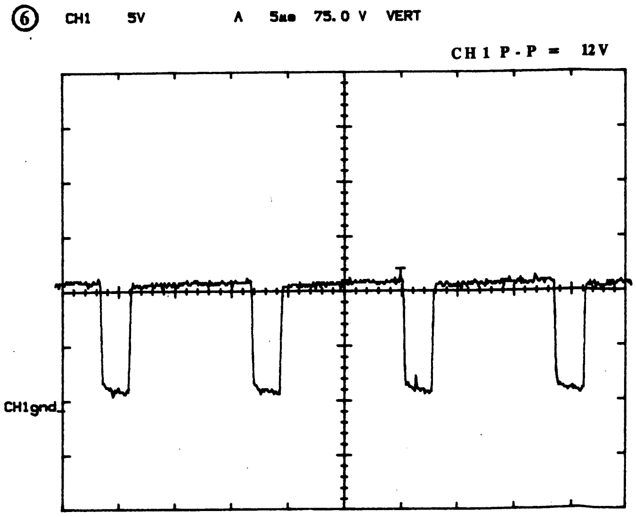

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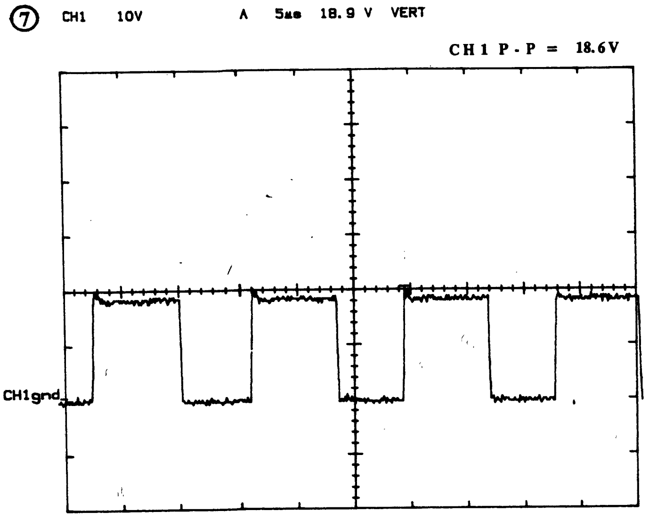
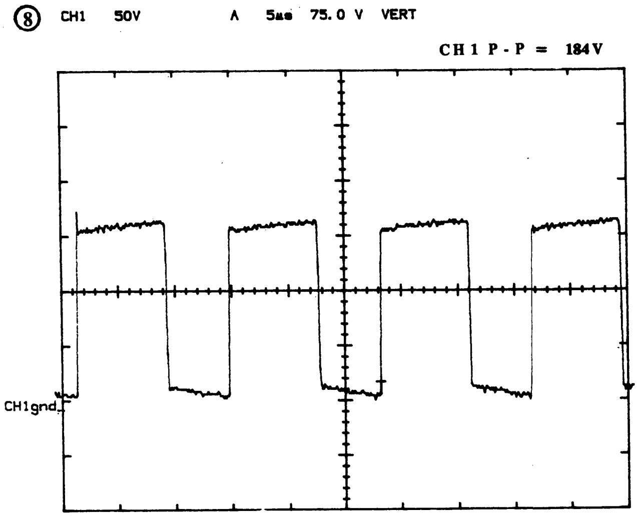
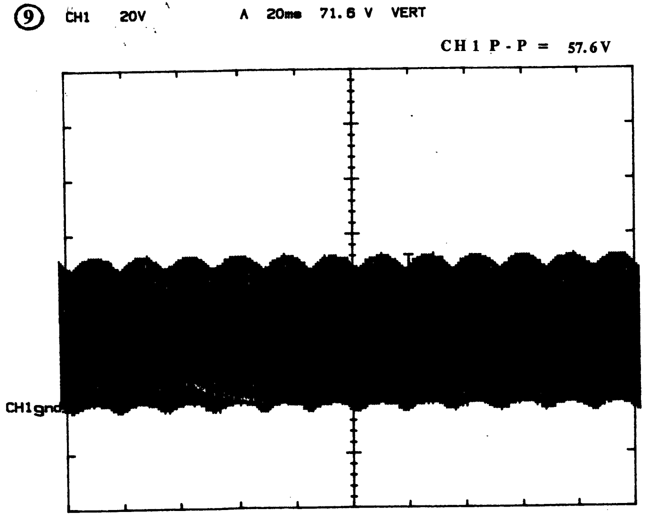

CH1 10V A 5μs 18.9 V VERT
CH1 P-P = 18.6V
CH1gnd

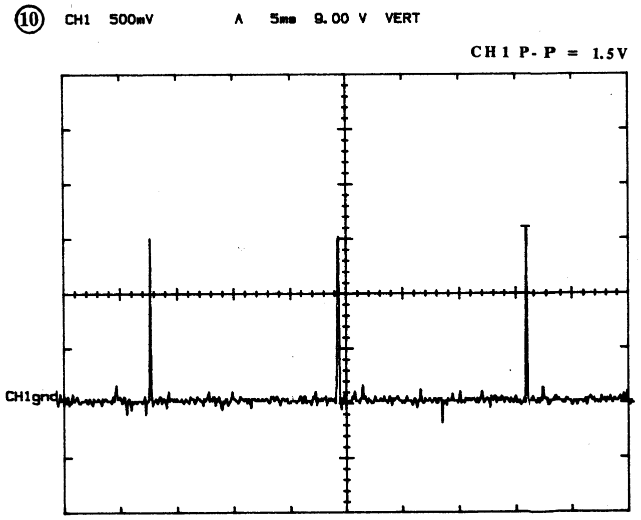
⑧


CH1 50V A 5μs 75.0 V VERT
CH1 P-P = 184V
CH1gnd

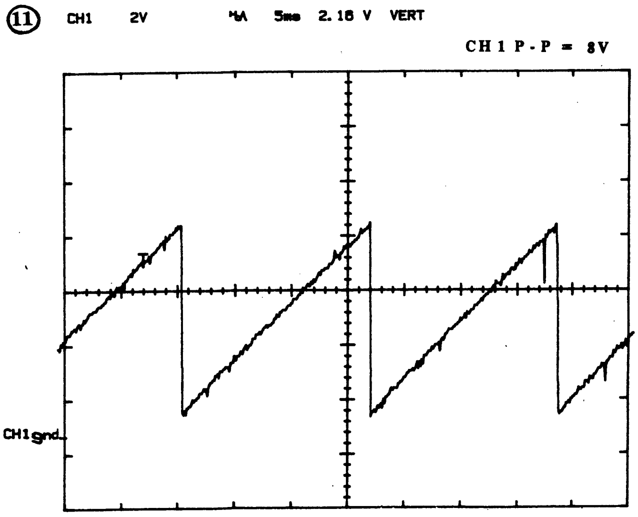
⑨


CH1 20V A 20ms 71.6 V VERT
CH1 P-P = 57.6V
CH1gnd

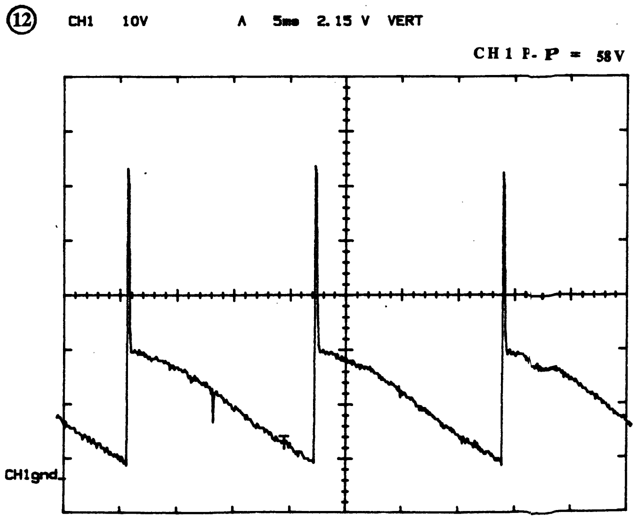
⑩


CH1 500mV A 5ms 9.00 V VERT
CH1 P-P = 1.5V
CH1gnd

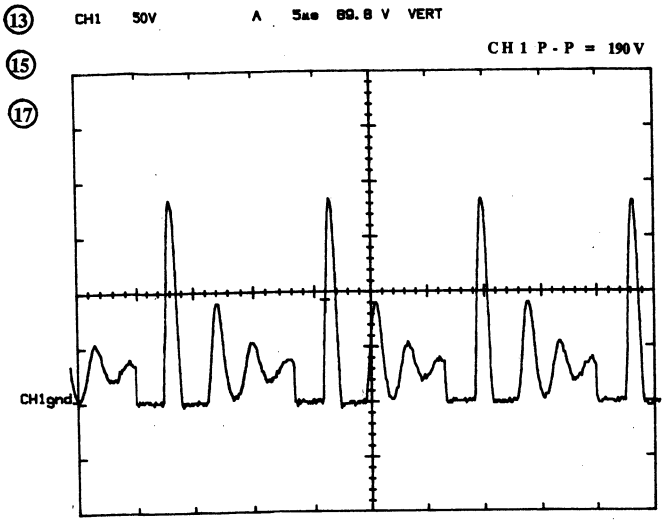
⑪


CH1 2V A 5ms 2.16 V VERT
CH1 P-P = 8V
CH1gnd

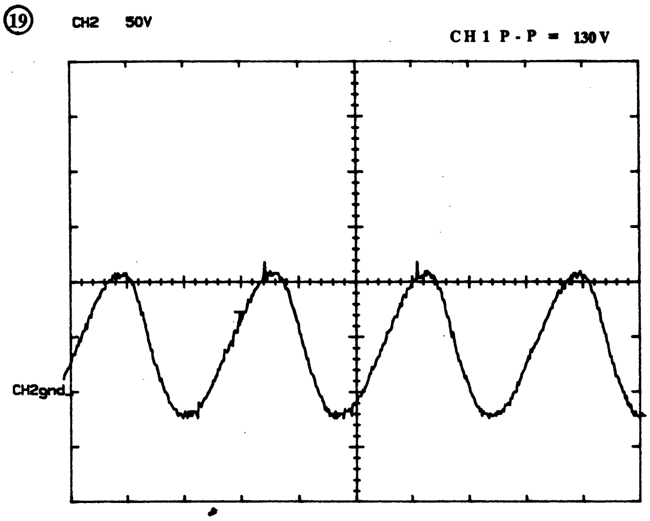
⑫


CH1 10V A 5ms 2.15 V VERT
CH1 P-P = 58V
CH1gnd

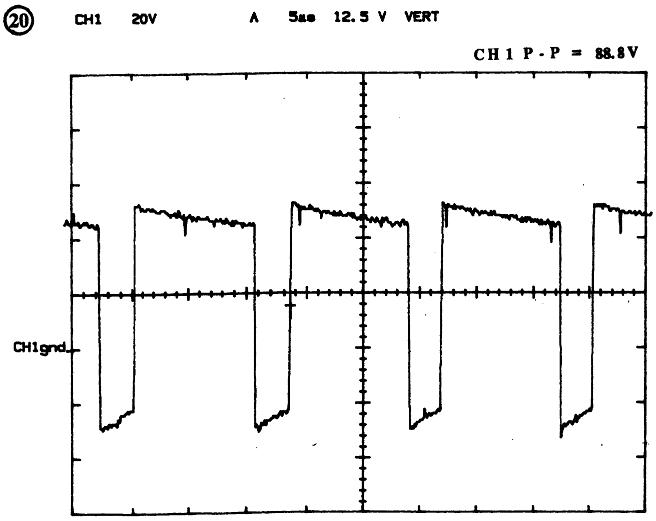
⑬
⑮
⑰


CH1 50V A 5ms 89.8 V VERT
CH1 P-P = 190V
CH1gnd

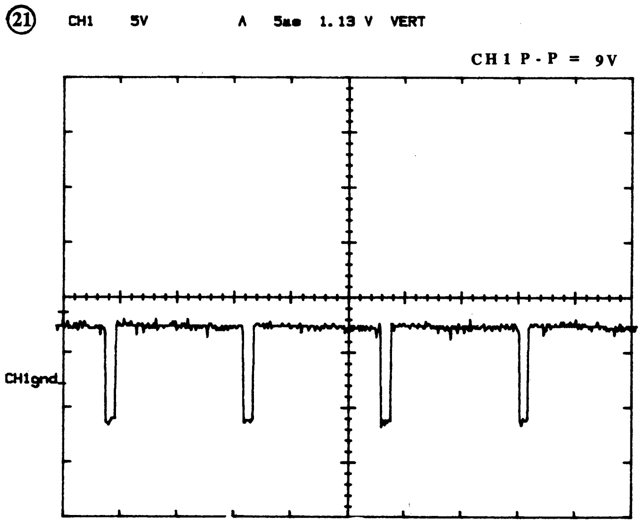
⑲


CH2 50V
CH1 P-P = 130V
CH2gnd

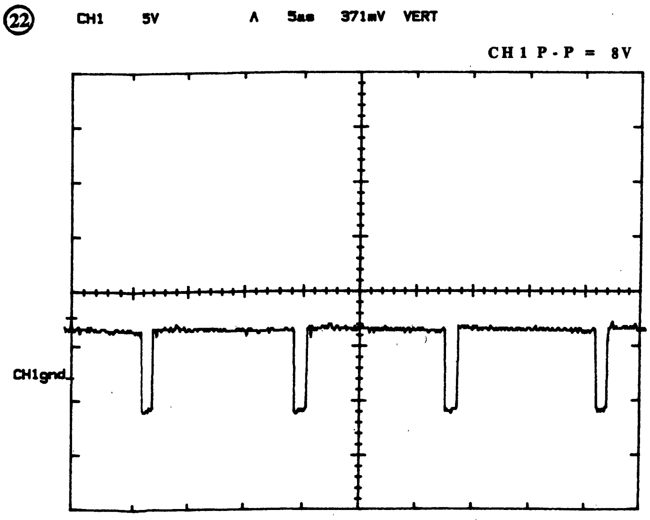
⑳


CH1 20V A 5ms 12.5 V VERT
CH1 P-P = 88.8V
CH1gnd

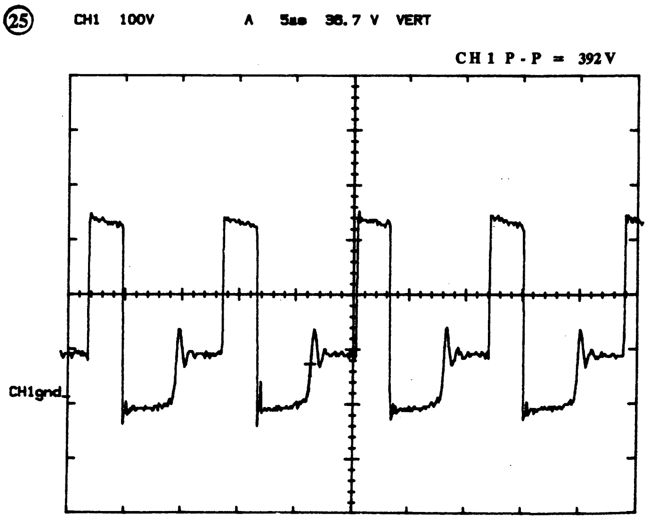
㉑


CH1 5V A 5ms 1.13 V VERT
CH1 P-P = 9V
CH1gnd

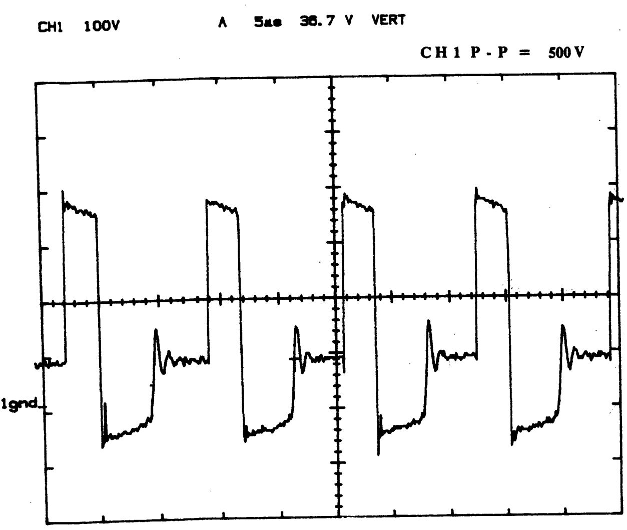
㉒


CH1 5V A 5ms 371mV VERT
CH1 P-P = 8V
CH1gnd

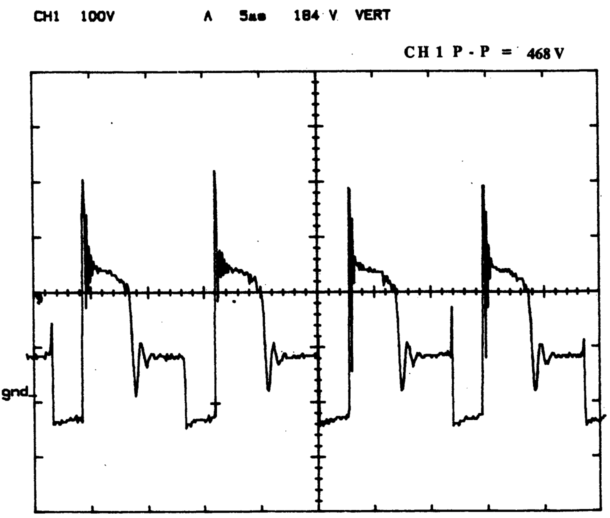
㉕


CH1 100V A 5ms 38.7 V VERT
CH1 P-P = 392V
CH1gnd

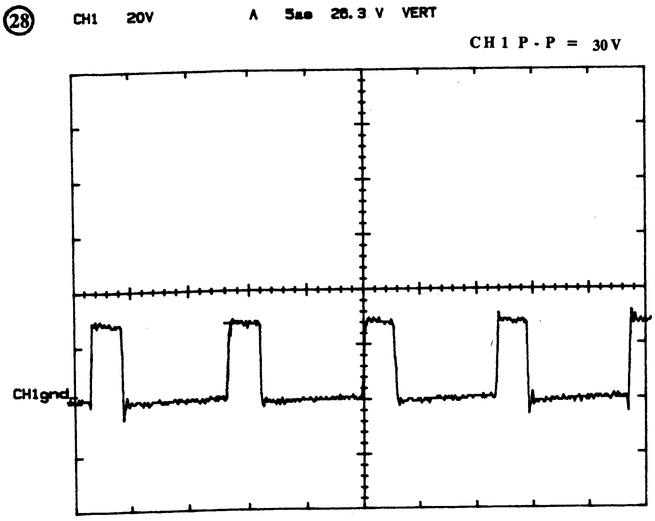
㉖


CH1 100V
A 5μs 36.7 V VERT
CH 1 P-P = 500 V
CH1gnd

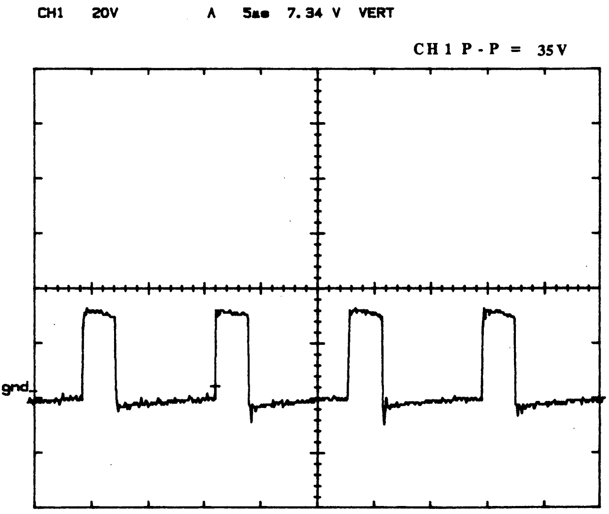
㉗


CH1 100V
A 5μs 184 V VERT
CH 1 P-P = 468 V
CH1gnd

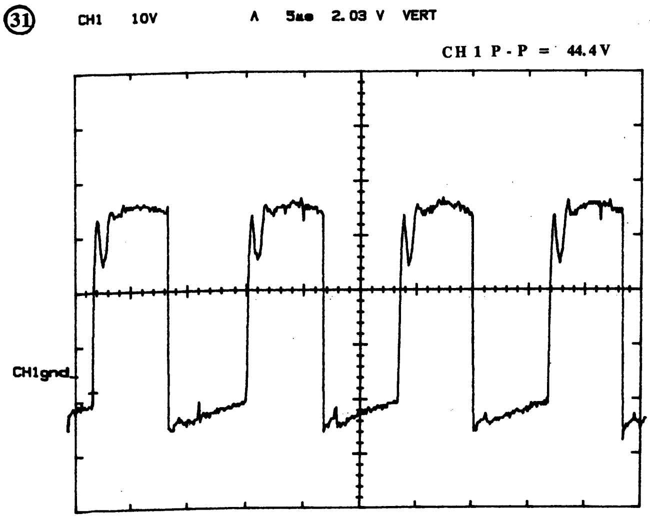
㉘


CH1 20V
A 5μs 28.3 V VERT
CH 1 P-P = 30 V
CH1gnd

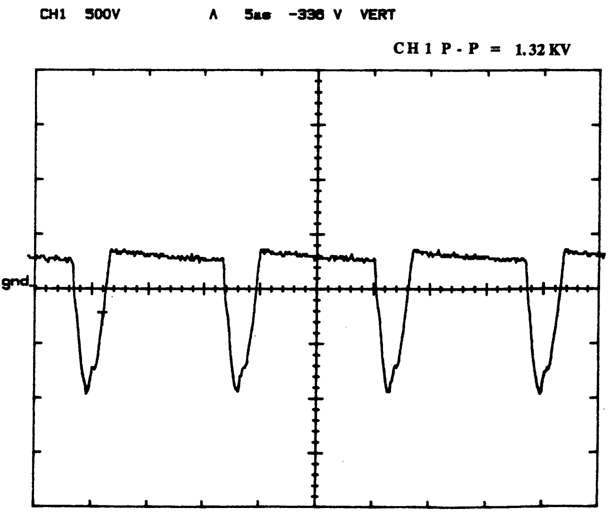
㉙


CH1 20V
A 5μs 7.34 V VERT
CH 1 P-P = 35 V
CH1gnd

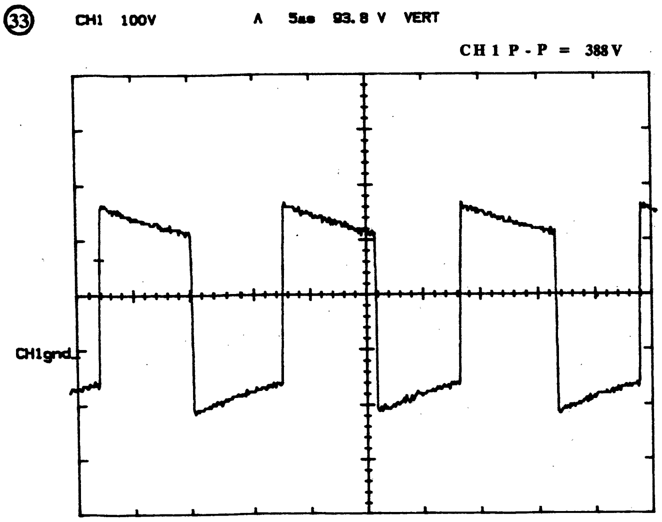
㉛


CH1 10V
A 5μs 2.03 V VERT
CH 1 P-P = 44.4 V
CH1gnd

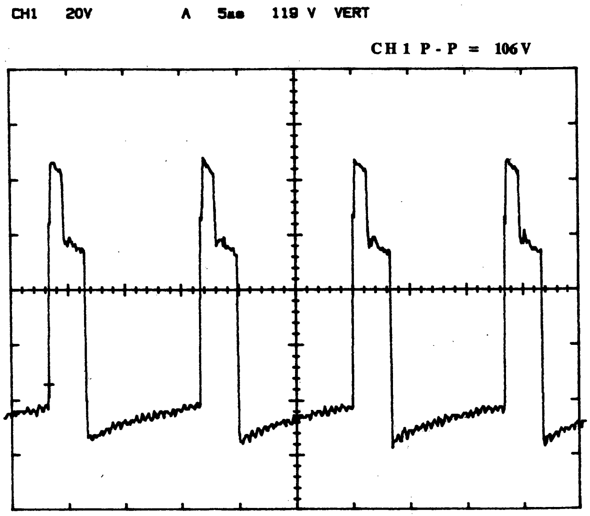
㉜


CH1 500V
A 5μs -338 V VERT
CH 1 P-P = 1.32 KV
CH1gnd

㉝


CH1 100V
A 5ms 93.8 V VERT
CH 1 P-P = 388V
CH1gnd

㉟


CH1 20V
A 5ms 119 V VERT
CH 1 P-P = 106V

SEMICONDUCTOR LEAD IDENTIFICATION (II)

NO.	TYPE	LOC.NO.	NO.	TYPE	LOC.NO
1	74HC221	IC205	16	VN2222LL	1203,205,404,406,
	LM1201	IC761,101,131,161			701,721,741,509
	MC14046B	IC401MPS4258	17	VN0606M	Q420
	MC14053	IC403	18	IRF740	Q1,603,604,722,742,407
	MPS2907	Q3,Q202,402,410,508,803		IRF610	Q72,762
	MC14504	IC408		IRF840	Q414
	PCF8574	IC407,506,851,852		IRF640	Q415,416,417,418
	TDA8444	IC309	19	MAC210	Q601,602
	74HC139	IC805	20	MJH16010A	Q413
2	74HC86	IC204		MJH16206	Q507
	LM324	IC103,104,404	21	KBC106	D603
	MC14011B	IC402,505	22	MUR10120E	D401
	IR2110	IC601	23	CR2424	IC102,132,162
3	74HC373	IC803			
	DAC8800	IC207,310			
4	D27128A	IC804			
5	M68HC11	IC801			
6	UC3842	IC400,701,721,741			
	UC3844	IC602			
	LM358	IC406			
7	CNY17-2	IC603			
	MOC3021	IC604			
8	TDA1675	IC311			
9	MC7805	IC202,801			
	MC7812	IC201			
10	MC7905	IC203			
11	TL431	IC511,605			
12	TIP29C	Q408,319			
	TIP30C	Q409			
13	MPS3646	Q401			
	MPSA42	Q102,132,162			
	MPS4258	Q201			
	MPS2222A	Q403,405,510,204,2,761,801			
	MPS2907	Q3,Q202,402,410,508,803			
	MPS2907	Q3,202,402,410,508,803			
14	KSR1001	Q518,519,606			
15	2SC3595	Q101,131,161			